A82 Tarbet to Fort William Route Action Plan Study

Firm Strategy – Final Report

Prepared for
Transport Scotland
February 2006

Scottish Executive
Enterprise, Transport & Lifelong Learning Department
Trunk Road Infrastructure and Professional Services Division

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Project Ref.	S100325
Approved	**[REDACTED}**
Date	28 February 2006

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1. INTRODUCTION

This report has been prepared by Scott Wilson Scotland on behalf of the Trunk Roads Infrastructure and Professional Services Division of the Scottish Executive, Enterprise, Transport and Lifelong Learning Department, as an integral part of the A82 Tarbet to Fort William Route Action Plan Study.

The considerable pressures and difficult operating conditions that prevail at certain times and on certain sections of the 108 kilometre section of the A82 trunk road between Tarbet and Fort William are acknowledged by most road users and are such that the Scottish Executive is developing a Route Action Plan of the route.

In particular, the long-term signalised shuttle working at Pulpit Rock near Ardlui, the significant queuing at Crianlarich, the environmental pressures of road traffic through Glencoe and the tortuous journey between Ballachulish and Fort William are recognised as some of the most significant difficulties along the route.

This commitment to develop a Route Action Plan will assist in addressing the immediate safety and operational concerns along the route, while assessing its medium to longer term investment needs, which will benefit the thousands of road users who depend on the route for lifeline transport services.

2. DEVELOPMENT OF A ROUTE ACTION PLAN

2.1 Objectives of Route Action Plans

A Route Action Plan comprises a set of local improvements, which have been optimised to address existing and emerging problems along the length of a route. These improvements are developed following an analysis of key factors such as current road characteristics, trends in road safety and prevailing operating conditions, and are supported by standard scheme appraisals and a prioritised programme of implementation considering in particular the interaction between adjacent schemes.

The RAP approach has been used for more than a decade to assist in assessing and improving conditions on various routes in the trunk road network.

2.2 A82 Route Action Plan Study Area and Objectives

The specific limits of the A82 Route Action Plan extend from the A82/A83 junction at Tarbet to the West End Roundabout at the northern end of the A82 single carriageway on the southern approach to Fort William.

The general location of the A82 route in relation to the road network in the northwest of Scotland is shown in Figure 2.1. The A82 corridor is shown in more detail in Figures 2.2a to 2.2e and the route chainage adopted for the study is shown in Figures 2.3a to 2.3f, to provide reference points along the route.

The principal objectives of the Route Action Plan are as follows:

- Consider the **overall importance of the role of the route** as part of the Trans-European Network and to the economy of the West Highlands;
- An investigation of the local interaction the route has with the **surrounding road network**;
- The identification of short, medium and long term improvement schemes required to **enhance road safety, reduce journey times and driver stress**;
- An investigation of the need for improving and increasing the number of **overtaking opportunities** to eradicate the conflicts between strategic, local and seasonal tourism traffic, i.e. coaches, caravans and continental right hand drive vehicles;
- The identification of what requirements and provisions should be made for other road users for example **pedestrians and cyclists**; and
- Consider whether there is a requirement to increase, improve or standardise the number of suitable rest areas such as **service areas, lay-bys and picnic areas** along the route.

In addressing the main objectives of the study, the following key issues have been considered:

- Route / Carriageway Improvements;
- Road Safety Improvements;
- Localised Carriageway Width Restrictions;
- Lay-bys and Rest Areas; and
- Pedestrians and Cyclists.

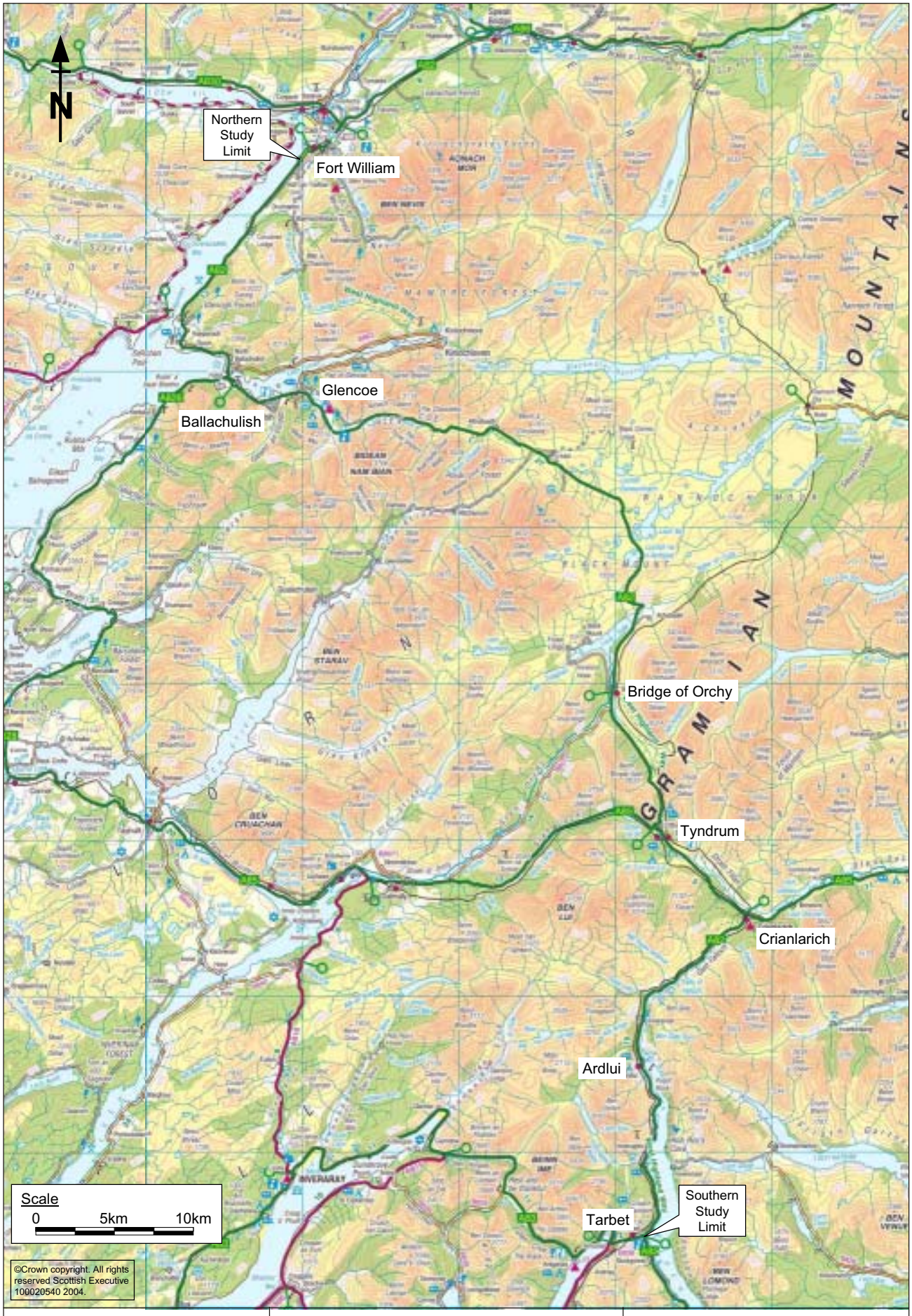

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Figure 2.1
General Location Plan

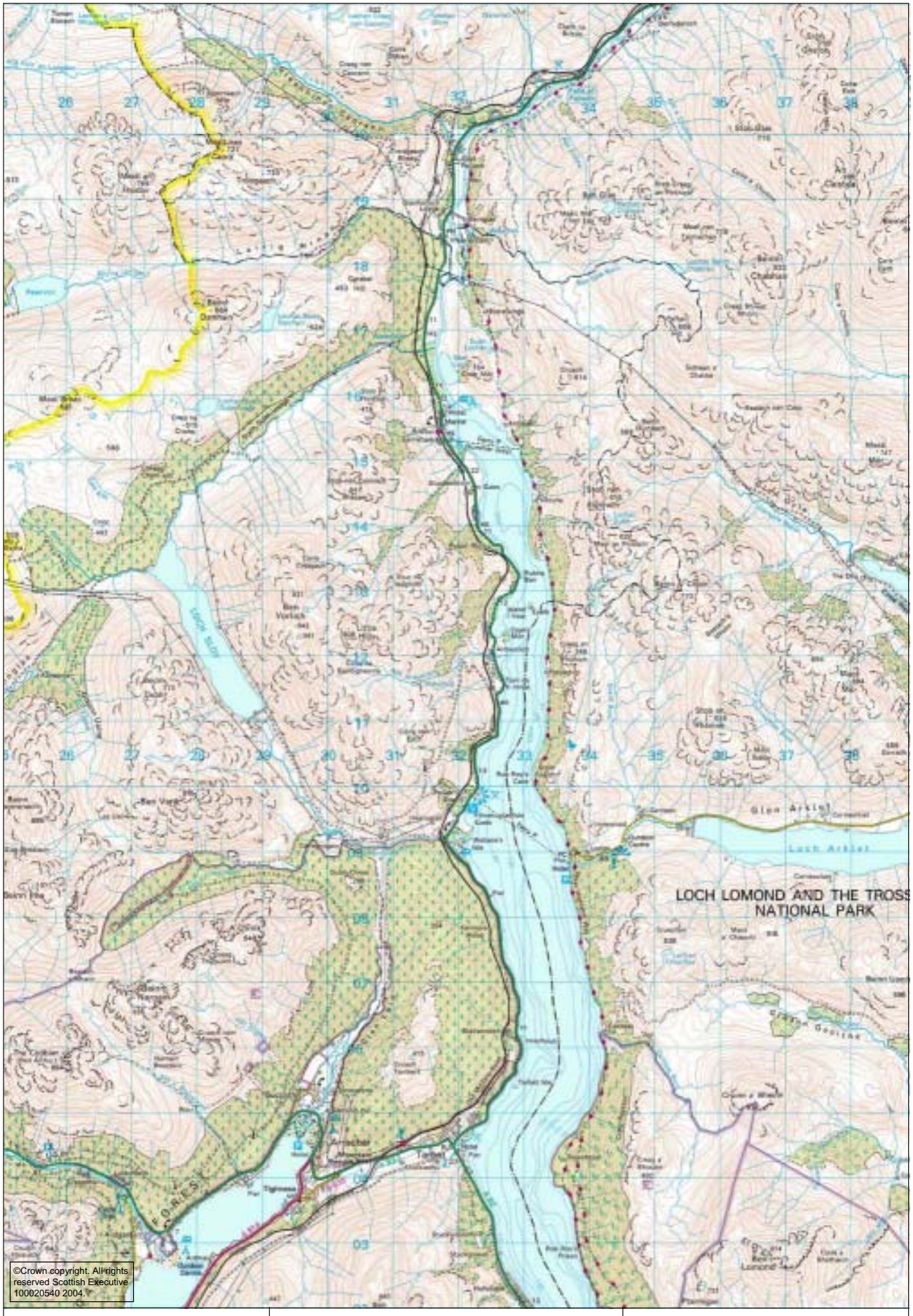

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Figure 2.2a
Location Plan

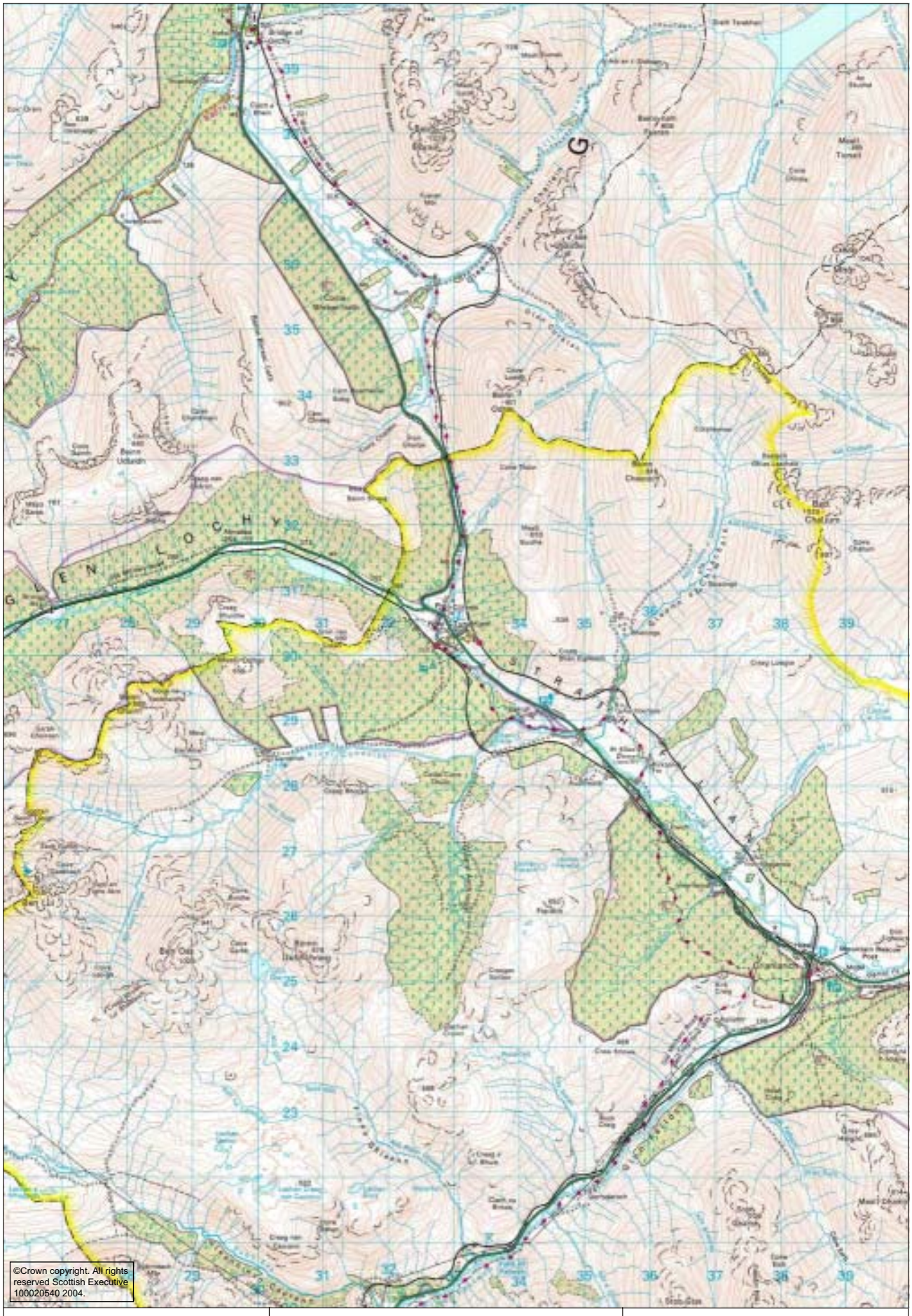

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Figure 2.2b
Location Plan

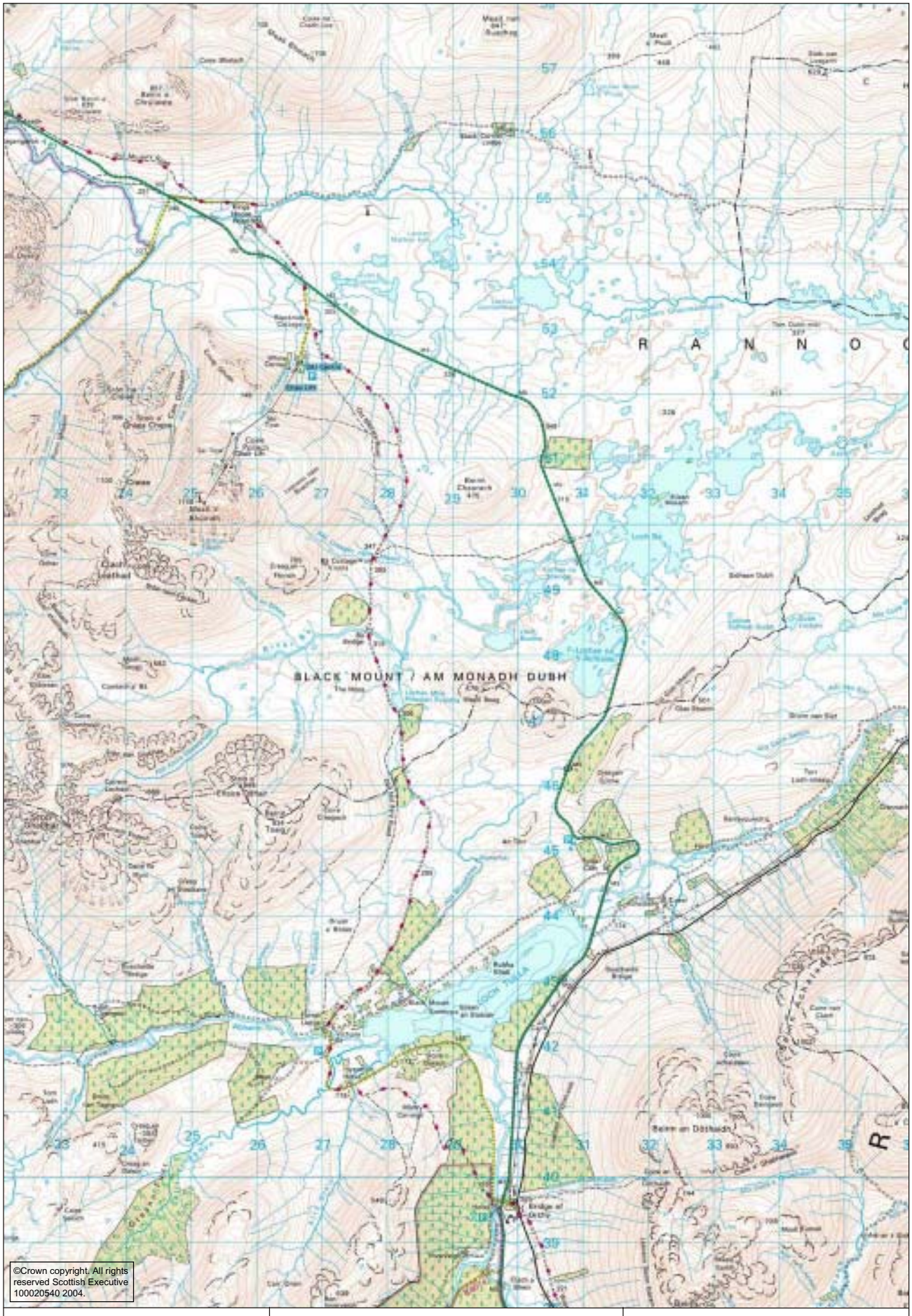

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Figure 2.2c
Location Plan

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Figure 2.2d
Location Plan

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Figure 2.2e
Location Plan

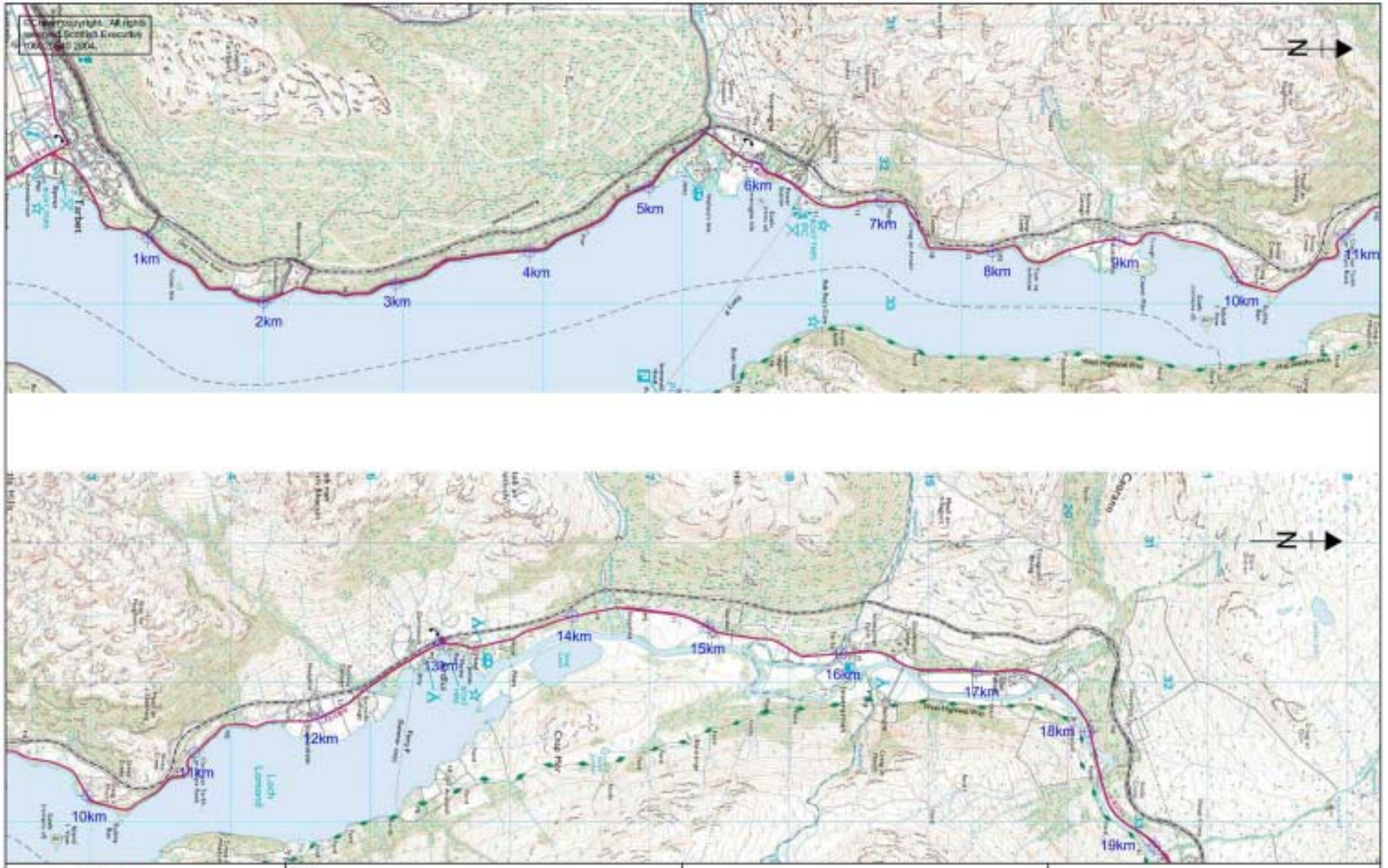

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Figure 2.3a
Route Chainage Location Plan

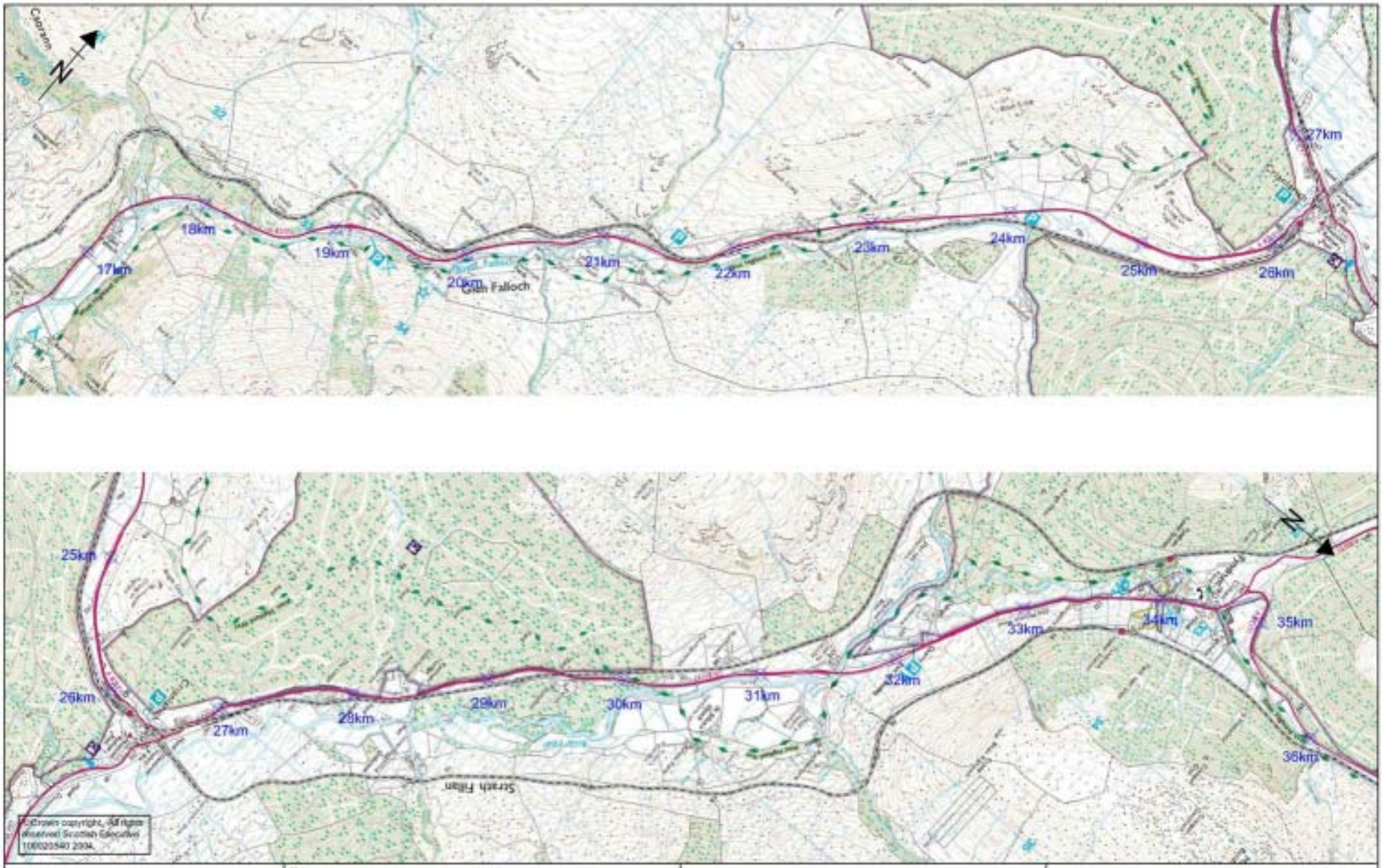

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Figure 2.3b
Route Chainage Location Plan

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Figure 2.3c
Route Chainage Location Plan

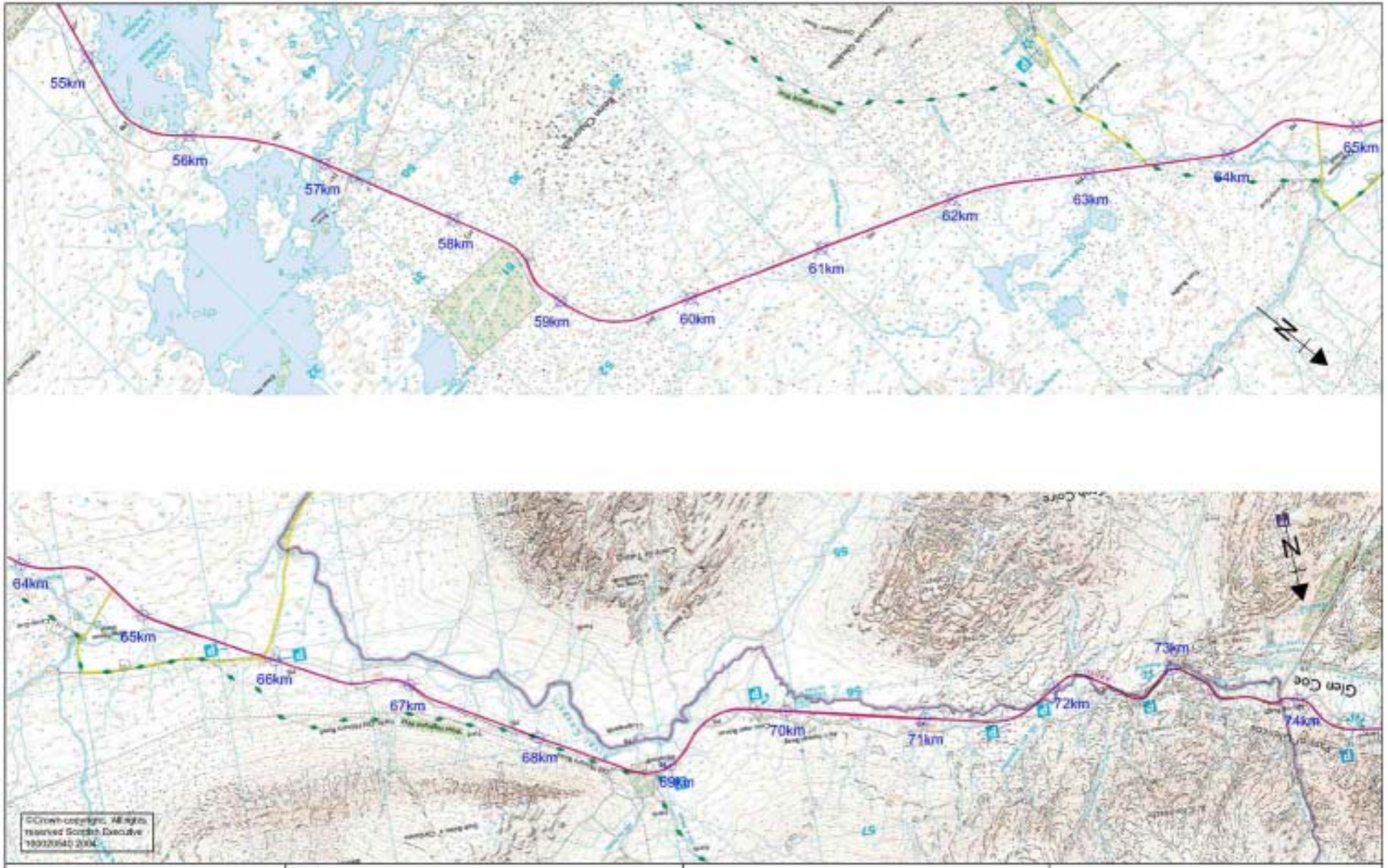

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Figure 2.3d
Route Chainage Location Plan

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Figure 2.3e
Route Chainage Location Plan

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Figure 2.3f
Route Chainage Location Plan

3. ASSESSMENT OF EXISTING CONDITIONS

3.1 Route Overview

The A82 trunk road between Glasgow and Fort William is the principal road link to the west of Scotland. The route is generally rural in nature between Tarbet and Fort William and consists of a single 2-lane carriageway of varying standards.

The principal communities along the 108 km route are Tarbet, Inveruglas, Ardlui, Crianlarich, Tyndrum, Bridge of Orchy, Glencoe, Ballachulish, Onich and Fort William, which the 2001 census indicates has a population of around 10,000.

The national speed limit of 60 mph applies over most of the route, except when travelling through the communities of Tarbet, Crianlarich, Tyndrum and Onich and on the approach to Fort William. Localised 40 mph speed limits have also been introduced on some sections of the route for heavy goods vehicles.

As there are no alternative routes within the immediate corridor, diversion routes often add significant additional time and distance to a journey.

Much of the carriageway is less than 7.3 metres wide and many sections do not have hardstrips or verges. The road width is constrained over some sections due to the proximity of lochs, a railway line, rock outcrops and narrow stone bridges and structures. The alignment of the road is also constrained by local topography, particularly on the sections of the A82 between Tarbet and Inverarnan, through the pass of Glencoe and between the Corran Ferry junction and Fort William.

An indication of general carriageway standards along the A82 route based on observation is shown in Figures 3.1a to 3.1f.

The key sections of the A82 trunk road which presently experience operational stress are as follows:

- Loch Lomond between Tarbet and Pulpit Rock due to the poor alignment along the side of the loch and the narrow carriageway width;
- Pulpit Rock due to the long-term traffic signals;
- Loch Lomond between Pulpit Rock and Inverarnan due to the poor alignment along the side of the loch and the narrow carriageway width on some sections;
- Crianlarich due to the A82/A85 priority junction and the constrained geometry at the two railway bridges;
- Loch Tulla, north Bridge of Orchy, due to the steep gradient; and
- Corran Ferry to Fort William due to the poor alignment along the side of the loch.

3.2 Route Description

The Tarbet and Fort William section of the A82 trunk can be considered in the following 4 sections:

- Tarbet to Crianlarich
- Crianlarich to Tyndrum
- Tyndrum to South Ballachulish
- South Ballachulish to Fort William

Tarbet to Crianlarich

The Tarbet to Crianlarich section of the A82 is 26.5 kilometres long and extends from route chainage 0.0 km to 26.5 km.

The route from Tarbet to Crianlarich varies in carriageway standard along its length as it passes through the settlements of Tarbet, Inveruglas, Ardlui, Inverarnan and Crianlarich. The tortuous geometry along this section of the A82 is well recognised and results is considerable delays to road users, particularly when a high number of tourists are attracted to the route during the summer months and when heavy goods vehicles are required to negotiate the tight horizontal bends and the narrow carriageway width.



This section also includes the long-term traffic signals at Pulpit Rock where shuttle working has been in operation for many years.


This section consists of a single carriageway with a 60mph speed limit over its length, except at Tarbet and Crianlarich where a 30mph speed limit is in operation.

Crianlarich to Tyndrum

The Crianlarich to Tyndrum section of the A82 is 6.8 kilometres long and extends from route chainage 26.5 km to 33.3 km.

The route from Crianlarich to Tyndrum is generally of a higher standard, although the two railway bridges in Crianlarich create tight horizontal geometry and restrictions in carriageway width and headroom. This section consists of a single carriageway with a 60mph speed limit over the majority of the route except at Crianlarich and Tyndrum where the speed limits are 30mph and 40mph respectively.

Tyndrum to South Ballachulish

The Tyndrum to South Ballachulish section of the A82 is 54.5 kilometres long and extends from route chainage 33.3 km to 87.8 km.

The route from Tyndrum to South Ballachulish is generally of a higher standard than the southern section of the route along Loch Lomond, although there are some steep gradients and the horizontal alignment through Glencoe is dictated by the local topography. A snow gate is located on the A82 a short distance to the north of the A82/A85 junction at Tyndrum, although operationally, it would seem that the gate should be located at the junction. This section consists of a single carriageway with a 60mph speed limit over the majority of the route except at Loch Tulla and Bridge of Orchy where a localised speed limit of 40mph applies to HGVs.

South Ballachulish to Fort William

The South Ballachulish to Fort William section of the A82 is 20.2 kilometres long and extends from route chainage 87.8 km to 108.0 km.

The route from South Ballachulish to Fort William passes over the Ballachulish Bridge and is generally of a good standard, but thereafter reflects the local natural constraints on the section between North Ballachulish and the Corran Ferry junction. Although the section to the north of the Corran Ferry junction is of a poorer standard, conditions improve on the final approach to Fort William. This section of the A82 consists of a single carriageway with a 60mph speed limit over part of the route except on the section between North Ballachulish and Corran Ferry where a localised speed limit of 40 mph applies to HGVs, and on the approach to Fort William where the speed limit reduces to 40 mph and then 30 mph.



Further details of the route are contained in the Baseline Report.

3.3. Operating Conditions

Introduction

A comprehensive programme of data collection surveys was undertaken in May, August and September 2004 to define existing operating conditions throughout the year and along the route. The key details of the manual and automatic traffic counts, journey time surveys, queue surveys and roadside interview surveys are summarised below. Full details of the surveys are set out in the Baseline Report.

Manual Classified Counts

Manual classified counts (MCCs) of traffic were undertaken at 9 locations during May and August 2004, with data being recorded in 15-minute intervals over a 12-hour period between 0700 hours and 1900 hours.

The following 13-vehicle classification system was adopted for the surveys to provide a detailed record of current traffic conditions along the route.

1 - Bicycles
2 - Motorbikes
3 - Cars & Taxis
4 - Car-based LGVs
5 - Non-car-based LGVs
6 - Caravanettes & Minibuses
7 - 2-axled HGV < 7.5T
8 - 2-axled HGV > 7.5T
9 - 3-axled Goods
10 - > 4-axled Goods
11 - Buses & Coaches
12 - Car + Caravan
13 - Other (e.g. agricultural)

A82 Traffic Volumes

To provide an indication of the changes in overall traffic volumes along the route, the 2-way weekday 12-hour traffic flows observed in May 2004 are summarised generally as follows:

- At Tarbet 3300 vehs
- Tarbet to Crianlarich 2700 to 2800 vehs
- Crianlarich to Tyndrum 4900 to 5000 vehs
- Tyndrum to Glencoe 2700 to 3100 vehs
- Glencoe to South Ballachulish 4000 to 4200 vehs
- South Ballachulish to Fort William 4900 to 5300 vehs
- At Fort William 6300 vehs

On the section of the A82 between Tarbet and Crianlarich, some 7% to 8% of vehicles were Heavy Goods Vehicles (HGVs). North of Crianlarich to Fort William, some 10% of observed vehicles were HGVs.

During the summer period, traffic volumes on the A82 increase significantly. The observed traffic flows indicate that 2-way weekday 12-hour traffic flows in August are generally as follows:

- At Tarbet 4800 vehs
- Tarbet to Crianlarich 4100 to 4300 vehs
- Crianlarich to Tyndrum 6700 to 6900 vehs
- Tyndrum to Glencoe 2800 to 4800 vehs
- Glencoe to South Ballachulish 5900 to 6400 vehs
- South Ballachulish to Fort William 7000 to 7500 vehs
- At Fort William 8600 vehs

On the section of the A82 between Tarbet and Crianlarich, some 7% of vehicles were HGVs. Between Crianlarich and Tyndrum, the percentage of HGVs increased to 10%, although this reduced to 8% north of Tyndrum.

During the peak weekend in the peak summer period, traffic volumes on the A82 increased further. The observed traffic flows indicate that 2-way weekend 12-hour traffic flows in August are generally as follows:

- At Tarbet 8400 vehs
- Tarbet to Crianlarich 7700 vehs
- Crianlarich to Tyndrum 12200 vehs
- Glencoe to South Ballachulish 9000 vehs
- South Ballachulish to Fort William 10100 vehs

During the peak summer period in August 2004, some 5% to 6% of vehicles were HGVs.

The locations of the MCC surveys and the observed 12-hour traffic flows are shown in Figure 3.2.

Temporary Automatic Traffic Counters

Temporary automatic traffic counters (ATCs), using pneumatic tubes, were installed at six locations during May and August 2004 to assist in defining hourly and daily variations in traffic flows and vehicle speeds.

To record traffic flows during a neutral period, the ATCs were installed for a 2-week period between Monday 17 May and Sunday 30 May 2004, and to record traffic flows during the peak tourist season, the ATCs were installed for a 3-week period between Friday 6 August and Monday 30 August 2004.

Data from the counters were recorded in hourly intervals for each direction of travel with 13 separate vehicle classifications. The recorded 2-way traffic flows and the

average vehicle spot-speeds measured at each of the ATC locations are summarised in Table 3.1.

Table 3.1 – ATC Recorded 2-way Traffic Flows/ Vehicle Speeds for May 2004

Location	12-Hr Flow (w'day)	24-Hr Flow (w'day)	12-Hr Flow (Sat)	24-Hr Flow (Sat)	Mean Speed (mph)	85th Perc. Speed (mph)
Near Pulpit Rock	2900	3500	5900	7000	36	42
South of Crianlarich	2900	3400	5800	6700	56	64
South of Tyndrum	4900	5800	9100	10500	58	66
Rannoch Moor	3400	4000	6900	7900	62	73
Pass of Glencoe	3200	3900	6200	7100	41	47
South of Fort William	6000	7000	7500	8900	49	55

The results from the ATCs confirm the traffic flows observed during the manual classified traffic counts and provide a record of the daily traffic flows along the A82 in the neutral period.

The 12-hour and 24-hour 2-way traffic flows and the average spot speeds recorded during the August 2004 traffic surveys are summarised in Table 3.2.

Table 3.2 – ATC Recorded 2-way Traffic Flows/ Vehicle Speeds for August 2004

Location	12-Hr Flow (w'day)	24-Hr Flow (w'day)	12-Hr Flow (Sat)	24-Hr Flow (Sat)	Mean Speed (mph)	85th Perc. Speed (mph
Near Pulpit Rock	4300	5100	7000	8200	36	41
South of Crianlarich	3800	4500	6800	7900	52	59
South of Tyndrum	6700	8000	10100	11700	53	61
Rannoch Moor	3900	4700	6900	7800	56	66
Pass of Glencoe	4100	4800	6900	7700	38	44
South of Fort William	7400	8700	8700	10000	46	52

The results from the August ATCs indicate that traffic volumes increase significantly during the peak tourist season, although it should be noted that the volumes might have been adversely affected by the severe weather conditions, which resulted in road closures in the area.

The locations of the ATC surveys and the recorded traffic flows and vehicle speeds are shown in Figures 3.3a and 3.3b.

Journey Time Surveys

Journey time surveys (JTSs) were undertaken between Tarbet and Fort William during May and August 2004 to assist in defining changes in operating conditions along the length of the A82 and under varying traffic demand. Some twelve runs were carried out on each day of survey. The surveys were repeated on Saturday 7 August and Monday 16 August 2004 to record journey times during the peak tourist season.

Examination of the survey data indicates the variations in vehicle speeds over the length of the route between conditions in May and August and between weekday and weekend (Saturday) conditions.

The variation between the minimum and maximum speeds provides an indication of journey time reliability, which is particularly significant on sections with reduced overtaking opportunities. The effect of peak summer traffic volumes on vehicle speeds is also apparent, especially with regard to the changes in minimum speeds along the route.

A comparison of the average vehicle speeds recorded during the journey time surveys undertaken in May and August 2004 is shown in Figures 3.4a and 3.4b.

Queue Surveys

Queue length surveys were undertaken at four locations along the A82 during May and August 2004.

For three of the four queue survey locations, the methodology adopted was to record the number and classification of all vehicles queuing on the approaches to the junctions in 5-minute intervals. The fourth queue survey was carried out at the traffic signals at Pulpit Rock and recorded the vehicle queue length at the start of each green phase of the signals.

Examination of the 5-minute interval spot queue survey results undertaken in May 2004 indicates that queues of 1 to 5 vehicles occurred on 20% of occasions for southbound traffic approaching the A82/A83 junction at Tarbet, with a maximum queue length of 7 vehicles. During a typical weekday in August, queues of between 1 and 5 vehicles occurred on 31% of occasions with queues of 6 to 10 vehicles occurring on 25% of occasions.

The traffic signals at Pulpit Rock on the short single lane section of the A82 can lead to significant localised queuing. The results from the May surveys indicate that queues of between 1 and 5 vehicles were recorded on 85% of occasions for northbound traffic approaching the traffic signals. Queues of between 6 and 10 vehicles were recorded on 12% of occasions with a maximum queue length of 17 vehicles. As expected, the increased traffic demand associated with summer traffic resulted in increased queuing, with queues of between 6 and 10 vehicles occurring on 16% of occasions and a maximum queue length of 15 vehicles.

During a typical Saturday in August, when traffic demand was particularly high, queues of between 6 and 10 vehicles and between 11 and 15 vehicles were recorded on 28% and 23% of occasions respectively for northbound traffic with a maximum queue length of 21 vehicles.

At Crianlarich, where the A82 meets the A85 at a priority junction, northbound queue lengths of between 1 and 5 vehicles were recorded on 22% of occasions during the May surveys, with a maximum queue length of 7 vehicles. In August, queues of between 1 and 5 vehicles were recorded on 36% of occasions, with queues

of between 6 and 10 vehicles being recorded on 26% of occasions, with a maximum queue length of 9 vehicles.

At the A82/A828 roundabout, the results of the May surveys indicate queues of between 1 and 5 vehicles on only 6% of occasions for traffic heading towards Fort William, increasing to 11% during the August period.

Roadside Interview Surveys

Two roadside interview surveys (RSIs) were undertaken on the A82 in August and September 2004. The locations of the RSIs were selected to minimise risk to road users and survey staff and were located in sections of reduced speed limit, namely at Tyndrum and Onich. The RSI at Onich was re-located in September to the southbound approach to the Ballachulish roundabout due to disruption to the survey in August.

The purpose of the RSI surveys was to establish the origin, destination and trip purpose of road users on the A82 and to record the level of tourist activity during peak and off-peak periods. The surveys recorded details of road users in the northbound direction at Tyndrum and in the southbound direction at Onich/Ballachulish.

The data collected during the surveys has been used to define travel patterns and trip purposes for inclusion in the traffic models being developed as part of the Strategic Assessment of the route.

Details of the trip patterns extracted from the RSI survey data for each of the survey locations are shown in Figures 3.5a to 3.5d.

Permanent Automatic Traffic Counts

The Scottish Executive maintains a database of traffic flow information for the trunk road network through a series of Automatic Traffic Counters (ATCs). Information from the Scottish Road Traffic Database (SRTDb) has been examined to identify variations in seasonal and annual traffic flows along the route.

Within the Tarbet to Fort William section of the A82, there are currently six permanent ATCs.

Seasonal Traffic Flows

To provide an indication of the level of variation in traffic flows throughout the year, the daily, weekly and monthly average daily traffic flows were extracted from the SRTDb for each individual traffic counter. Although six counters have been installed on the road, few counters provide continuous long-term data.

Examination of the data indicates the normal variations in seasonal traffic flows that occur on tourist routes, although the recorded peak daily flows on the A82 in April are particularly high.

Examination of the ATC information at the six permanent sites indicates that the most lightly trafficked sections of the A82 are to the north of Tarbet and to the north Tyndrum. The most heavily trafficked sections of the route are between Crianlarich and Tyndrum, where the A82 and A85 traffic combine, and on the A82 Ballachulish Bridge, where the A82 and A828 traffic combine.

At Tarbet, the annual average daily traffic (AADT) flow in 2003 was 3,600 vehicles. The average daily flow in August increased by approximately 70% relative to the AADT flow, to 6,100 vehicles. Although the AADT flow to the north of Tyndrum is slightly lower at 3,300 vehicles, the same 70% increase in traffic flow to 5,600 vehicles was recorded in August 2003. At Ballachulish Bridge, which is the most heavily trafficked section of the A82 counted on a permanent basis, the average daily traffic flow in August of 8,800 vehicles is 60% higher than the recorded AADT flow of 5,500 vehicles.

The peak daily traffic flows at each of the permanent ATC locations were recorded on Saturday 9 August 2003 and are as follows:

- ATC North of Tarbet 9620 vehicles, i.e. 2.7 times the AADT
- ATC North of Tyndrum 8860 vehicles, i.e. 2.7 times the AADT
- ATC North of Ballachulish Br. 11710 vehicles, i.e. 2.1 times the AADT

Long-term Traffic Growth

The automatic traffic counters located at Crianlarich and at Ballachulish provide reasonably continuous traffic flow information from which annual trends can be estimated. It should be noted that fluctuations in monthly flows can lead to inconsistent indications of traffic growth.

At Crianlarich, the AADT flows increased from 4,500 in 1993 to 4,900 in 1998 and 5,400 in 2003. These traffic flows equate to annual growth rates of 1.6% and 2.2% respectively over the two consecutive 5-year periods, with an overall average annual growth rate over the 10-year period of 1.9% between 1993 and 2003.

At Ballachulish, the AADT flows increased from 4,000 in 1993 to 4,300 in 1998 and 4,600 in 2003. These traffic flows equate to annual growth rates of 1.2% and 1.8% respectively over the two consecutive 5-year periods, with an overall average annual growth rate over the 10-year period of 1.5% between 1993 and 2003.

Examination of the long-term AADT flows derived from the permanent ATCs over the last 10 years indicates that traffic flows on the A82 have generally increased by approximately 1.5% to 1.9% per annum.

The comparable national annual growth rates, as defined in National Road Traffic Forecasts 1997, based on the central traffic growth projection for the period between 1996 and 2001 is 1.74%, reducing slightly to 1.69% for the 5-year period between 2001 and 2006, for all traffic. This suggests that longer term traffic growth on the A82 has been generally consistent with NRTF central growth projections. The locations of the six permanent ATCs are shown in Figure 3.6.

3.4. Road Safety Conditions

The analysis of recent trends in road traffic accidents to identify road sections and specific locations which have above average personal injury accident rates and/or severity ratios is a key aim of the A82 Route Action Plan study.

To assist in assessing conditions within the Tarbet to Fort William corridor, information on all road traffic accidents on the A82 involving personal injury for the 5-year period between 1999 and 2003 was obtained from the Scottish Executive for analysis and comparison with national trends. Road traffic accidents which involve personal injury are classified into one of three categories, namely fatal, serious or slight, according to the most severely injured casualty.

Analysis of road traffic accidents on the Tarbet to Fort William section of the A82 indicates that the total number of personal injury accidents has generally decreased over the last five years. During this period, the number of Personal Injury Accidents (PIAs) has reduced from 75 in 1999 to 45 in 2003.

Examination of the data indicates that between 1 and 6 fatal accidents occurred annually on the A82 between 1999 and 2003. However, between 3 and 4 fatal accidents were recorded during 2001 to 2003, which indicates that the overall trend on the A82 is reasonably consistent.

The number of serious traffic accidents on the A82 has been decreasing steadily during the past 5-year period between 1999 and 2003 with the number of accidents reducing from 20 to 14 accidents per annum, although some 24 serious accidents were recorded in 2000.

Although the number of slight PIAs has generally reduced during the 5-year period between 1999 and 2003, the number of accidents has fluctuated between 49 and 24. In 2003, the number of slight accidents increased slightly to 27.

The trends in road traffic accidents and severities in each year between 1999 and 2003 and for each kilometre along the route are shown in Figures 3.7 and 3.8 respectively.

3.5. Environmental Conditions

This section outlines the key baseline environmental conditions along the length of the A82 route. Those elements that are most likely to be significant in terms of route improvements have been considered under the following sectoral issues:

- Ecology and Nature Conservation;
- Landscape and Visual;
- Cultural Heritage;

Full details of baseline conditions for the environment can be found in the Baseline Report.

Ecology and Nature Conservation

Baseline information on Ecology and Nature Conservation has focused on potential receptors identified within the 2km to 5km buffer zones. Sites that are immediately adjacent to the road or sites that the road passes through are highlighted by an asterisk in the text below with approximate Ordnance Survey Grid References (OSGRs).

Sites of International Importance

Special Areas of Conservation (SACs)

SACs are created under the EC Habitats Directive (92/43/EEC) and provide protection for certain key habitat types and species. Most SAC's underpinned by designation are Sites of Special Scientific Interest (SSSIs).

There are seven SACs within the 2km road corridor that are described below:

(1) Loch Lomond Woods* (NN338040)
(2) River Tay* (NN818481)
(3) Ben Lui (NN265260)
(4) Rannoch Moor* (NN348519)
(5) Glen Coe* (NN151543)
(6) Onich to North Ballachulish Woods* (NN042619)
(7) Ben Nevis (NN198705).

There is one additional SAC within the 5km road corridor, which is described below:

(8) Ben Heasgarnich (NN399358)

Special Protection Areas (SPAs)

SPAs are designated under the EC Directive (79/409/EEC) on the Conservation of Wild Birds. There is considerable overlap between SPAs and Ramsar sites (wetlands of international importance), many of which are designated in common.

There is one SPA within the 2km road corridor, which is described below:

Rannoch Lochs* (NN397558)

There are no additional SPAs within the 5km road corridor.

Sites of National Importance

National Nature Reserves (NNRs)

There is one NNR within the 2km road corridor, which is described below:

(1) Ben Lui (NN265264)

There are no additional NNRs within the 5km road corridor.

National Park

The National Park covers four distinctly different and special areas. These include Ben Lomond, which stands over Loch Lomond, the largest expanse of freshwater in Great Britain, The Trossachs - wild glens and lochs between Callander and Aberfoyle, Breadalbane, the high country of the north, with some of Scotland's finest munros, Ben Lui, Ben Challum, Ben More and Ben Vorlich, and The Argyll Forest of the Cowal peninsula which is bordered by sea lochs. The A82 corridor passes through the west of the park up along the western shores of Loch Lomond to the east of Ben Vorlich and on upwards towards Crianlarich, to the west of Ben More.

There are no additional National Parks within the 5km road corridor.

Sites of Special Scientific Interest (SSSIs)

There are 30 SSSIs within the 2km road corridor and 8 SSSIs within the 2km - 5km road corridor. These are listed separately.

Ancient and Long-Established Woodlands

There are 287 ancient woodland sites within the 2km road corridor and a further 183 ancient woodland sites within the 5km road corridor. Due to the extensive number of these sites, no further detail regarding individual sites is presented at this stage. Individual sites will be discussed further, once detailed schemes are available.

Sites of Regional or Local importance

Non-Statutory Nature Reserves

There is one non-statutory nature reserve within the 2km road corridor, which is described below:

(1) Inversnaid RSPB Reserve (NN340110)

There are no non-statutory nature reserves within the 5km road corridor.

Other sites

Watercourses

There are a large number of rivers, tributaries and burns within the 2km and 5km road corridors requiring consideration for their conservation value. The main watercourses are listed separately.

There are a large number of areas of standing water within the 2km and 5km road corridors, which also provide potential wildlife and nature conservation interest.

Protected Species

It is possible that the improvement options may impact on a number of protected species. Species identified which should be given consideration once the detailed schemes are known include otter, water vole, badger, red squirrel, wildcat, bat species and Atlantic salmon.

A number of protected bird species may be present within the route corridor including black-throated diver and several species of bird of prey (e.g. golden eagle).

Landscape and Visual

The study area contains the following landscape designations:

- National Scenic Areas: Ben Nevis and Glen Coe and Loch Lomond;
- Loch Lomond and the Trossachs National Park;
- Regional Scenic Areas;
- Areas of Great Landscape Value.

Landscape Character

The landscape character assessment uses the national landscape character assessment prepared by Scottish Natural Heritage. The relevant assessments for the route corridor are:

- Argyll and the Firth of Clyde. No. 78
- Central Region. No. 123
- Lochaber. No. 97

The area between Inverarnan and Inverherive, which includes Crianlarich, is covered by the, as yet unpublished, Loch Lomond and the Trossachs Landscape Character Assessment. The 'landscape character types' identified by the above assessments, are reported separately and gives their location along the route corridor, describes the relevant key characteristics of the landscape character types and the individual Landscape Character Areas (from south to north).

From an appraisal of the existing conditions along the route corridor there are four broad character areas which largely conform to those identified in the classification. These are described as local character areas and an assessment of the landscape quality is also report separately for each area.

Visual Baseline

The A82 is the main line of communication and a popular tourist route in this region. The landscape is largely viewed from the road and adjacent settlements, the railway line and the West Highland Way, which runs parallel for much of the study area. The zone of visual influence (ZVI) of the schemes is less important as most of the receptors are road users or from settlements adjacent to the road.

The numbers of potential visual receptors depend on the nature and visibility of the proposed works.

The visual baseline can be summarised as follows:

- Most of the receptors view the landscape from the road and changes will be highly visible from close range;
- There are a number of settlements adjacent to the route with sensitive residential receptors close by;
- The A82 can be viewed from the West Highland Way and the main railway line from close range;
- The A82 is a key tourist route through some of the most magnificent and highly valued scenery in Scotland and there are many highly sensitive tourist receptors who would view any works at close range;
- Much of the route runs through valleys with a number of large areas of woodland which help to screen the route and integrate it into the landscape;
- There are areas of wild, remote landscape with few receptors but any improvement works would be highly visible; and
- There are many visitors to the slopes and mountains, especially in Glencoe, who are highly sensitive and would view any improvement works from close, medium and long range and from elevated vantage points.

Cultural Heritage

The archaeological and cultural heritage remains identified from the NMRS are listed separately and consist of all the sites identified within the 5km study corridor, along with details of Scheduled Ancient Monuments (SAMs).

Noise and Vibration

There are settlements that are likely to contain receptors that may be sensitive to changes in traffic noise and vibration. The banding of these receptors, in relation to the distance of the receptor from the A82, will be clarified during the Stage 2 assessment. In

summary, there are 20 settlements of 0-10 receptors, 12 settlements of 10-50 receptors, and 4 settlements of 50+ receptors. There are a number of sensitive locations that have been identified along the route.

Air Quality

Settlements have been identified which are likely to contain receptors that may be sensitive to changes in air quality. The banding of these receptors, in relation to the distance of the receptor from the A82, will be clarified during the Stage 2 assessment. In summary, there are 20 settlements of 0-10 receptors, 12 settlements of 10-50 receptors, and 4 settlements of 50+ receptors.

There are no Air Quality Management Areas (AQMAs) in the corridor.

Geology and Soils

The whole of the route corridor is classed as land suited only to improved grassland and rough grazing under the Macaulay Land Use Research Institute (MLURI). The route is located on land classed as 6.3 with small areas of 6.2. However, the major river valleys of Strath Fillan, Glen Falloch, Loch Lomond side and Loch Leven side are classed as 6.1 and 5.2. There is a small area of land classed as 5.1 adjacent to Loch Tulla. Much of the route is upland hill farming with sheep being the predominant stock. There is some improved grassland on the lower slopes and valley bottoms.

The Loch Lomond Environmentally Sensitive Area is located in the southern part of the route.

The majority of the route lies on Dalradian schists and slates (metamorphic) with intrusions of granites and allied igneous rocks. The drift geology comprises largely morainic drift and shallow drifts with rock within 1m of the surface.

The MLURI soil classification of the route is as follows:

- Tarbet to Glen Falloch – drifts derived from Dalradian series;
- Strath Fillan – mainly fluvioglacial and raised beach sands and gravels derived from acid rocks. There are some drifts derived from schists of the Dalradian series and small areas of peaty podsols and gleys;
- Rannoch Moor – drifts derived from schists, gneisses, granulites and quartzites of the Moine series;
- Glen Coe - drifts derived from Tertiary acid, intermediate and basic igneous rocks;
- Loch Linnhe – drifts derived from Dalradian limestones and calcite rocks.

No features of high importance to geology have been identified along the route.

Land Use

The A82 route passes through rural and remote areas of the highlands. Most of the land is used for hill farming/rough grazing with large areas of moorland and forestry. The

existing route is a major recreational route. Within the larger settlements there are multiple land uses including residential, industrial, commercial and recreational uses.

Water Resources

There are many surface water features within the study area, the majority of which are small burns draining into the main watercourses from the adjacent hillsides.

The named watercourses and the SEPA Water Quality Classifications for the significant rivers and streams within the corridor are listed separately.

Disruption due to Construction

There are 20 settlements which are likely to contain receptors that may be sensitive to construction disruption of 0-10 receptors, 12 settlements of 10-50 receptors, and 4 settlements of 50+ receptors.

There are a number of sensitive locations that have been identified along the route. These have the potential to be affected by a range of construction impacts including, dust disturbance, noise and vibration intrusion, and temporary severance.

Pedestrians, Cyclists, Equestrians & Community Severance

There are a number of settlements that have been identified along the route. These have the potential to be affected by a range of impacts including, dust disturbance, noise and vibration intrusion, and temporary/permanent severance due to traffic measures, which may result in impacts on pedestrians, cyclists, equestrians and the wider community.

Driver Stress

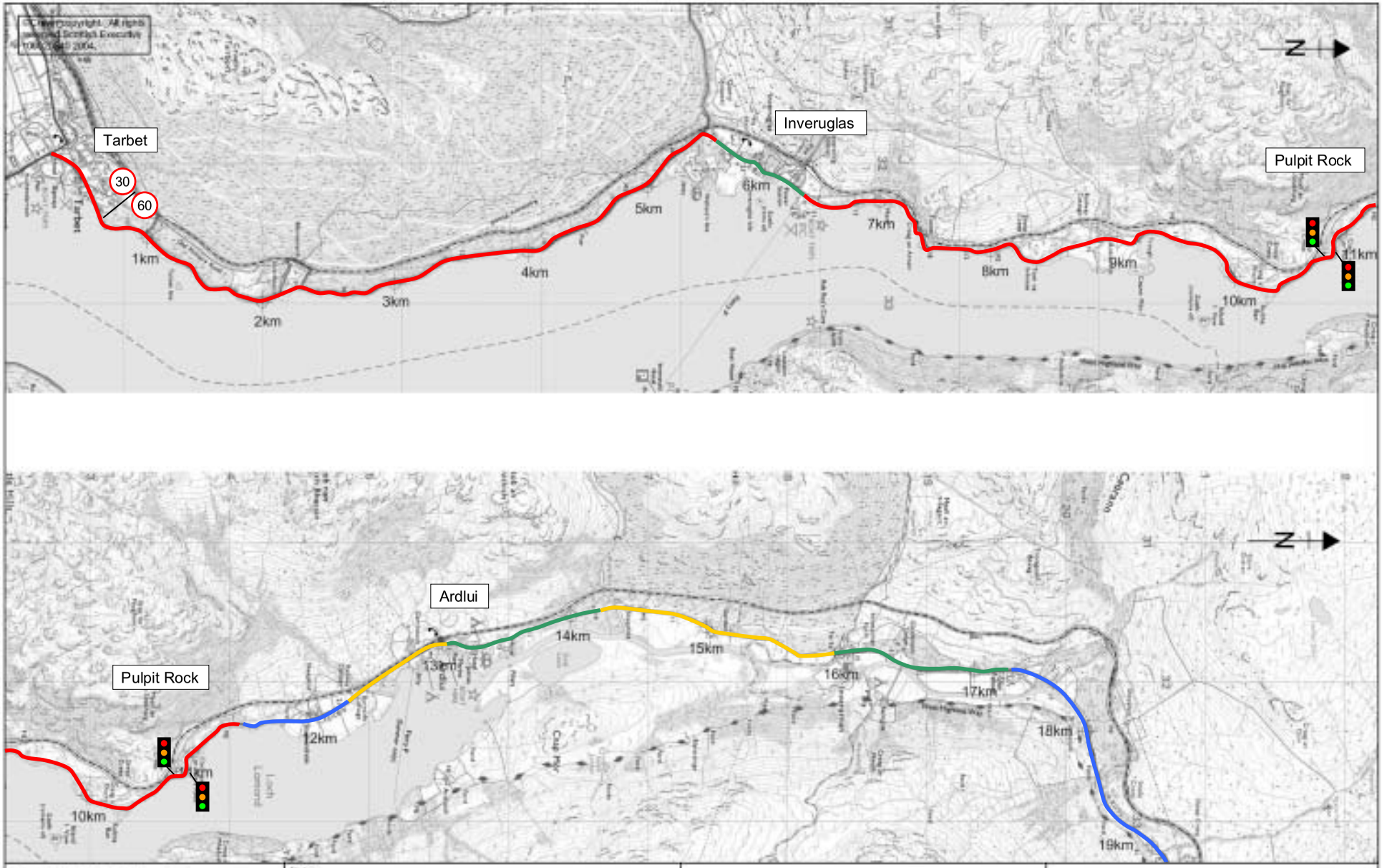
The existing route would be assessed as moderate for overall driver stress with the above categories described as follows:

Frustration - Although the road is designed to a good standard overall, there is a lack of passing places and the topography restricts visibility in places. The most restricted areas are Glencoe where the road is narrow, steep and winding and along Loch Lomond where the road is narrow. There are a number of settlements along the route with speed restrictions and some sections which have restricted speed limits for HGVs only.

Fear of potential accidents – the route is one of the main arteries through Scotland and therefore carries a volume of traffic including heavy vehicles. The road is narrow and with restricted visibility in places. Adverse weather conditions are a common occurrence which will increase the perception of fear on the road.

Uncertainty relating to the route being followed – The existing signing along the route is good.

Details of the environmentally sensitive areas along the A82 have been highlighted on Figures 3.9a to 3.9f.



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Notes:
Scale at A3 1:25,000

Speed Limit 60 | 30

Type A
Good Standard

Type B
Above Route Average Standard

Type C
Below Route Average Standard

Type D
Poor Standard

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Figure 3.1a
General Carriageway Standard

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Speed Limit 60 | 30

Type A
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Type B
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Type C
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Type D
Poor Standard

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Figure 3.1b
General Carriageway Standard

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Speed Limit 60 | 30

Type A
Good Standard

Type B
Above Route Average Standard

Type C
Below Route Average Standard

Type D
Poor Standard

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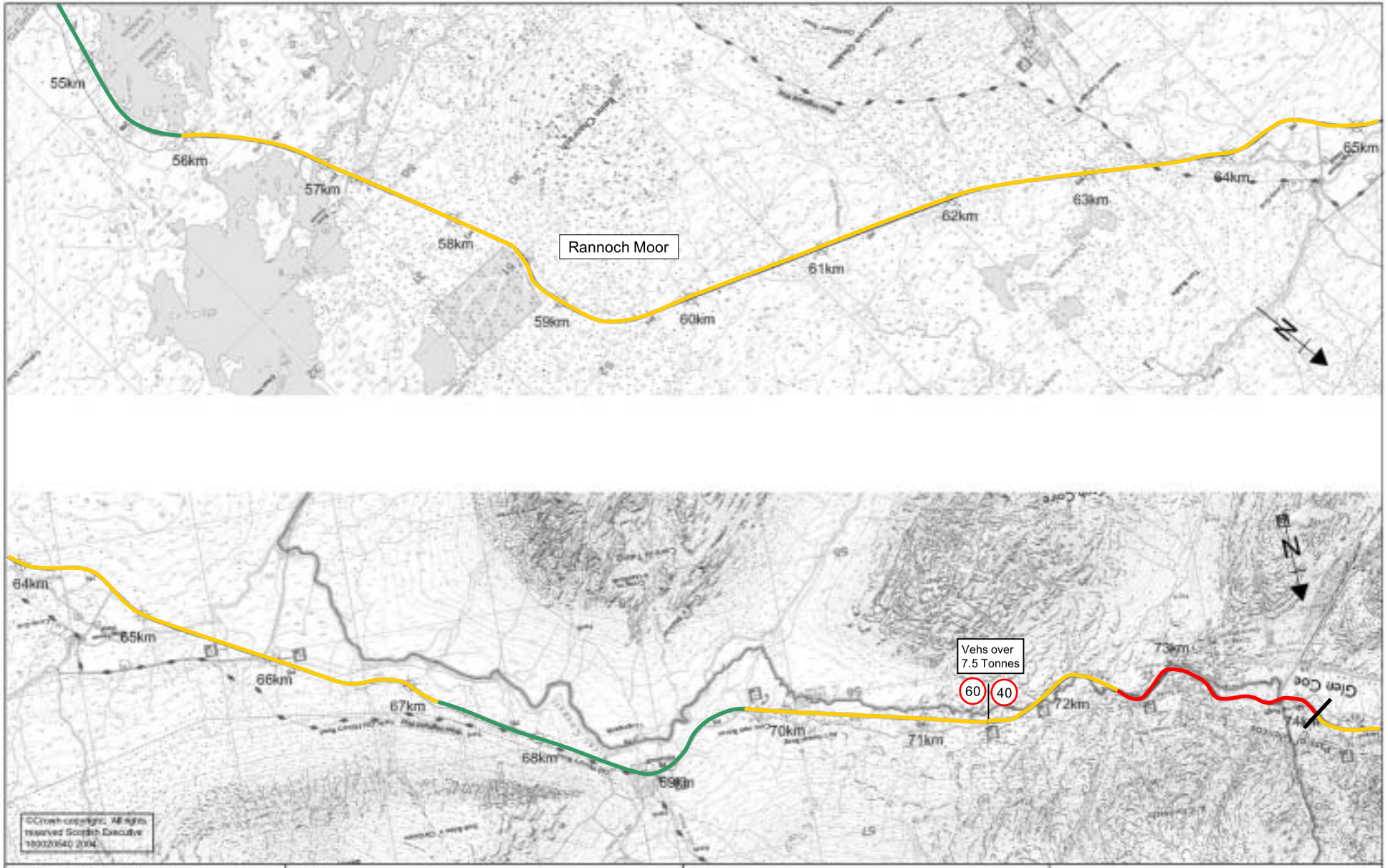
Figure 3.1c
General Carriageway Standard



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Notes:
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Speed Limit 60 | 30

Type A
Good Standard

Type B
Above Route Average Standard

Type C
Below Route Average Standard

Type D
Poor Standard

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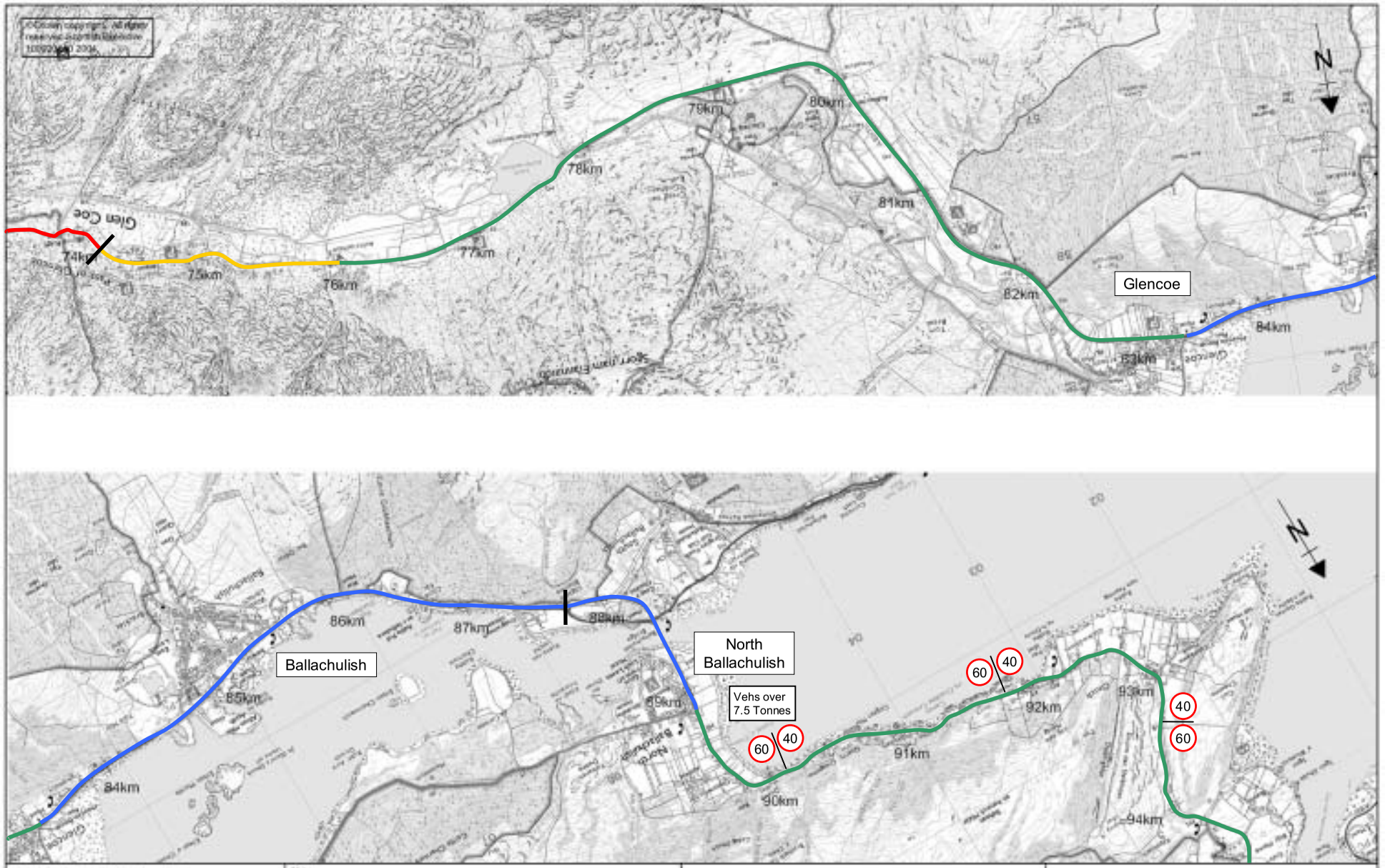
Figure 3.1d
General Carriageway Standard



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Notes:
Scale on A3 1:25,000

Speed Limit 60 | 30

Type A
Good Standard

Type B
Above Route Average Standard

Type C
Below Route Average Standard

Type D
Poor Standard

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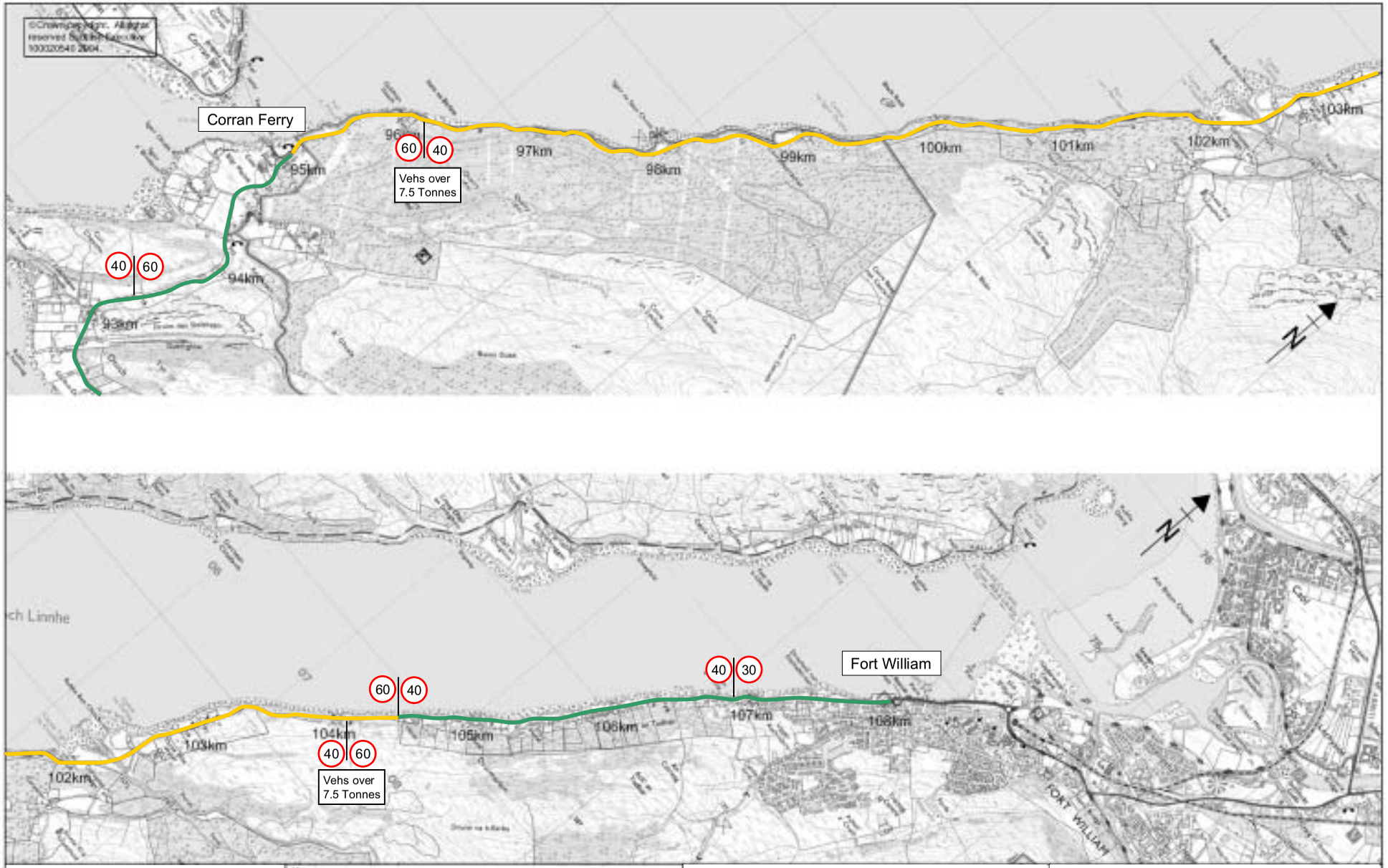
Figure 3.1e
General Carriageway Standard



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Notes:
Scale at A3 1:25,000

Speed Limit 60 30

Type A
Good Standard

Type B
Above Route Average Standard

Type C
Below Route Average Standard

Type D
Poor Standard

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Figure 3.1f
General Carriageway Standard

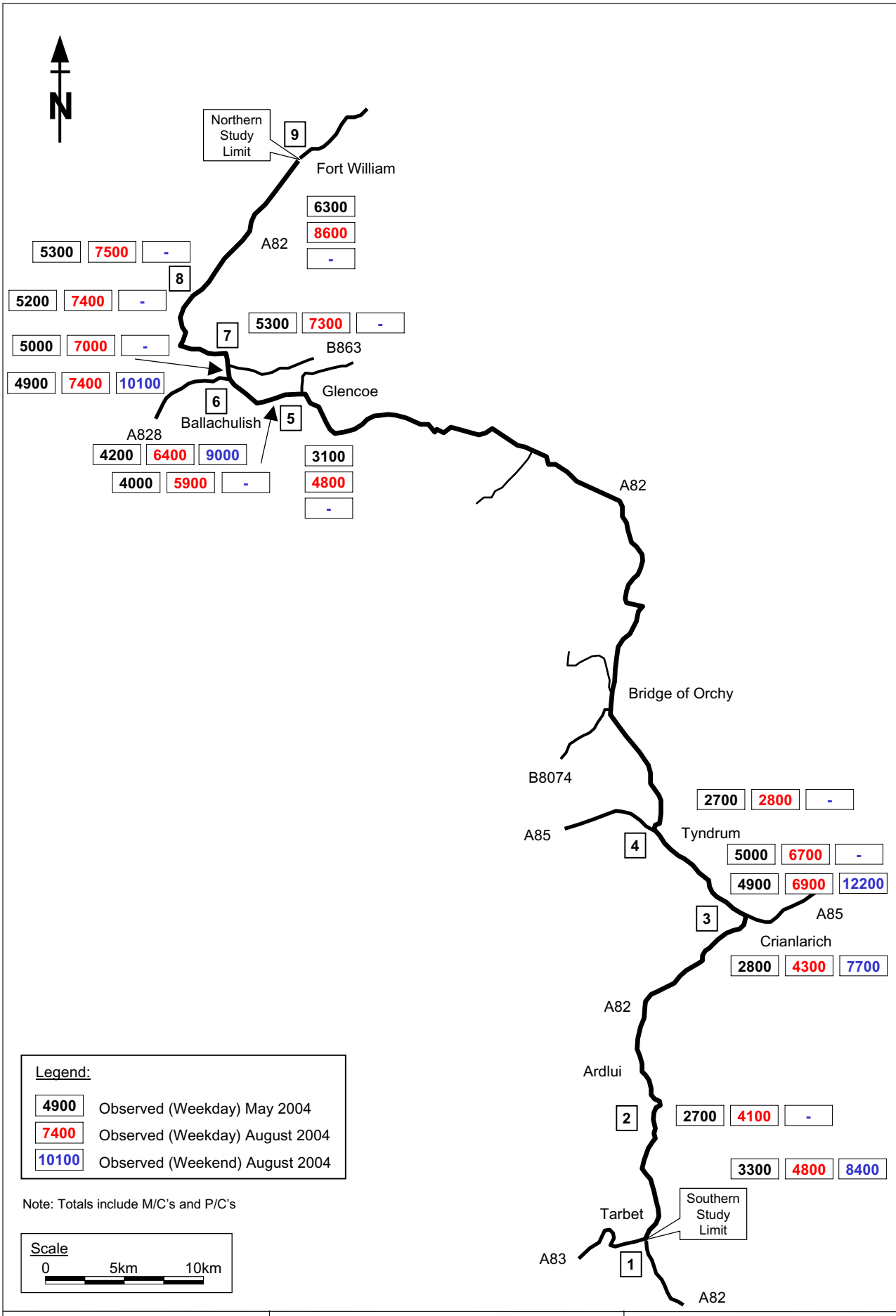

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Figure 3.2
Observed 12-Hour 2-way MCC Data

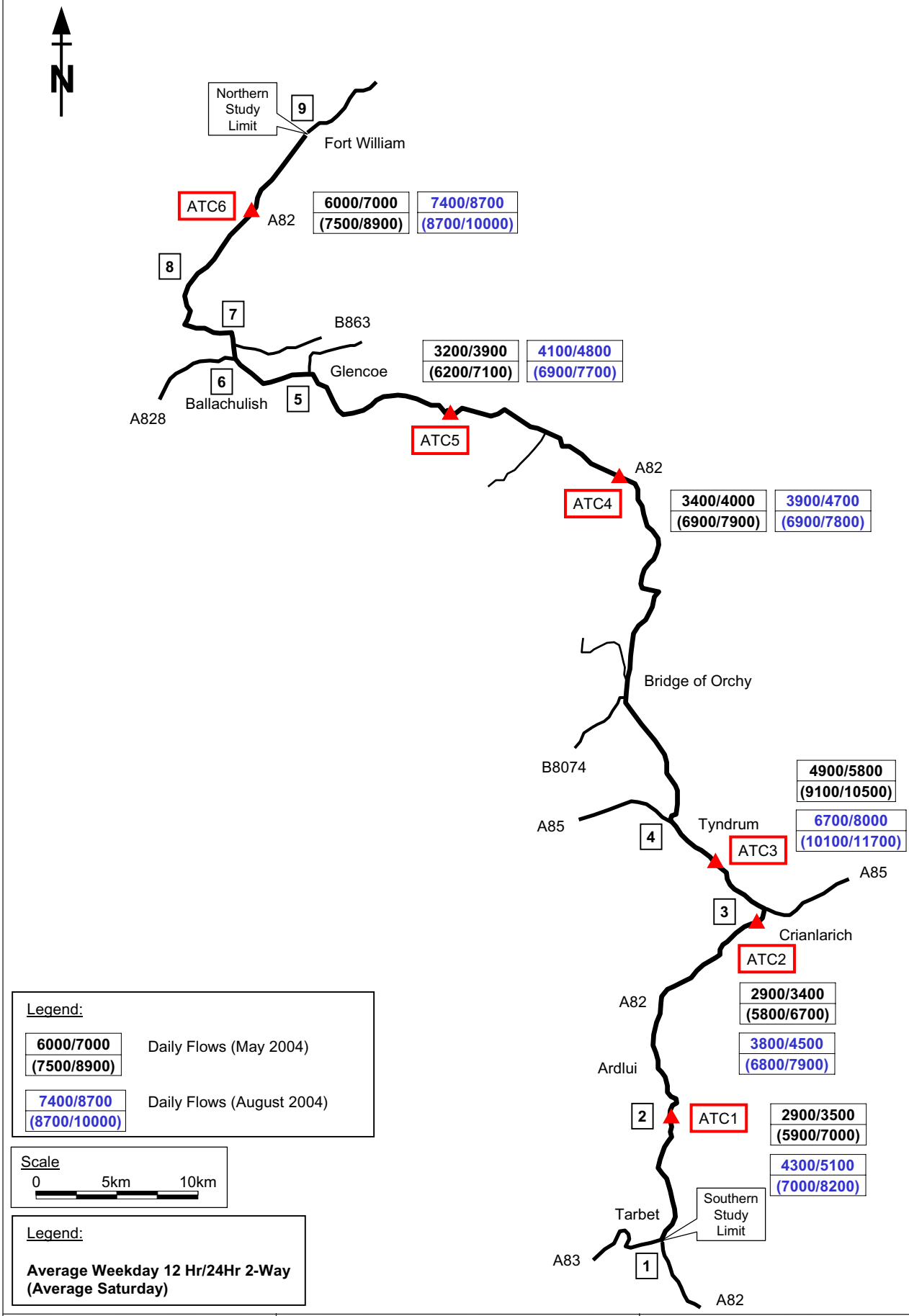

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Figure 3.3a
Temporary ATC Information
Daily Flows
(May and August 2004)

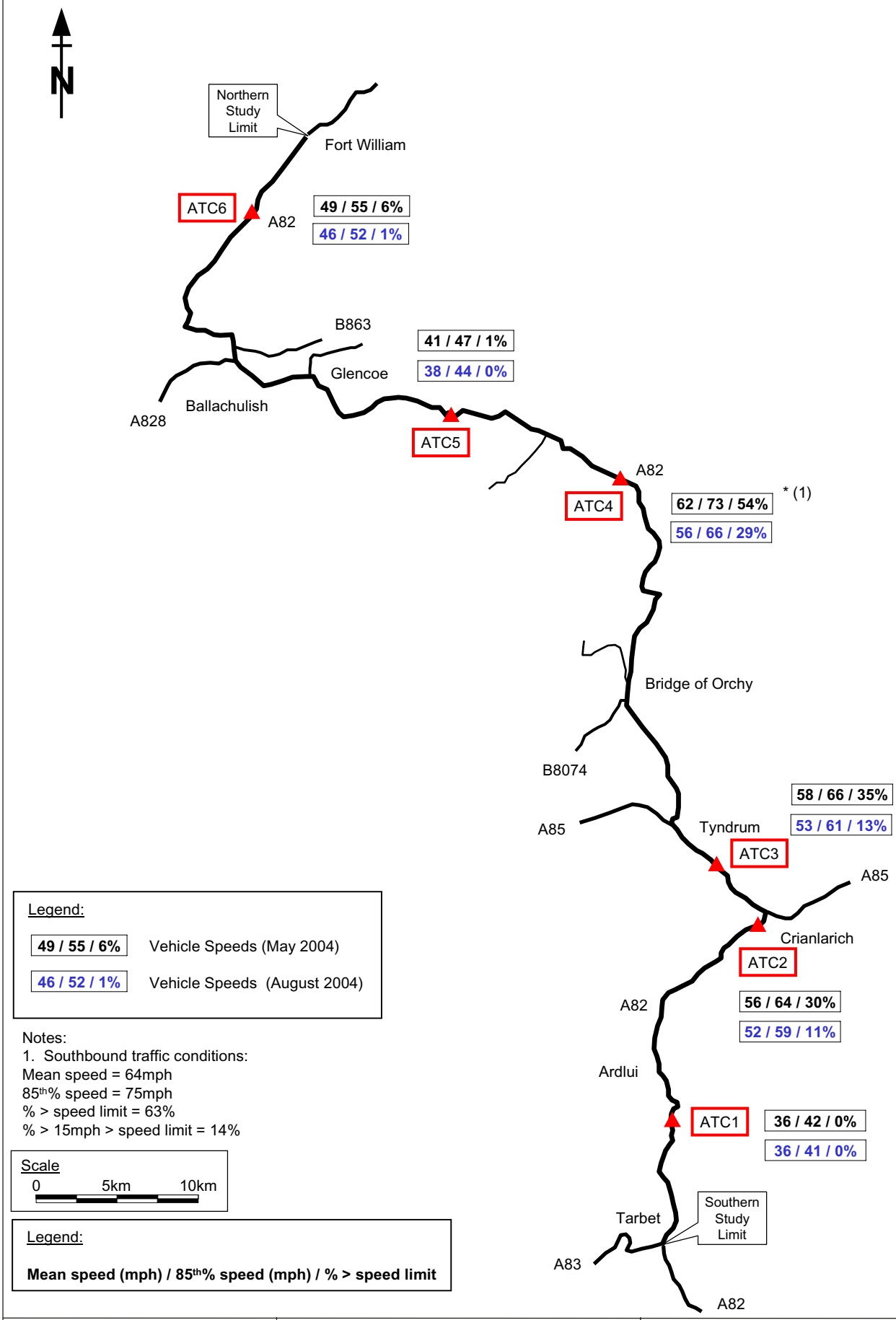

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Figure 3.3b
Temporary ATC Information
Vehicle Speeds
(May and August 2004)

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Journey Time Survey - Comparison of Average Flows May - August 2004, Northbound

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Figure 3.4a
Journey Time Survey 2004
Comparison of Average Vehicle Speeds
May – August Northbound

A82 Tarbet to Fort William Route Action Plan
Journey Time Survey - Comparison of Average Flows May - August 2004, Southbound

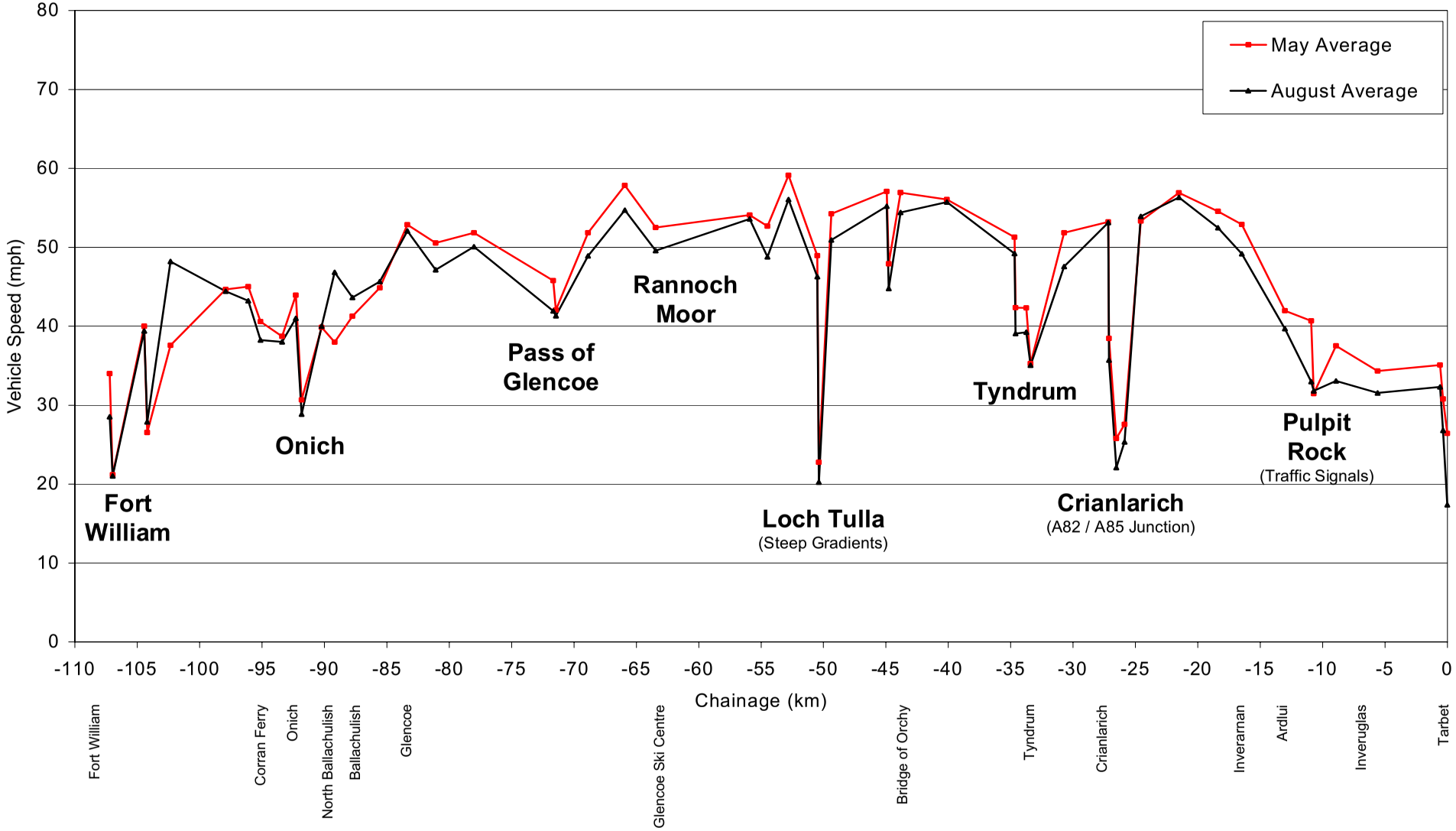

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Figure 3.4b
Journey Time Survey 2004
Comparison of Average Vehicle Speeds
May – August Southbound

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RSI Trip Patterns Site 1 Tyndrum Aug 2004 (Scotland)

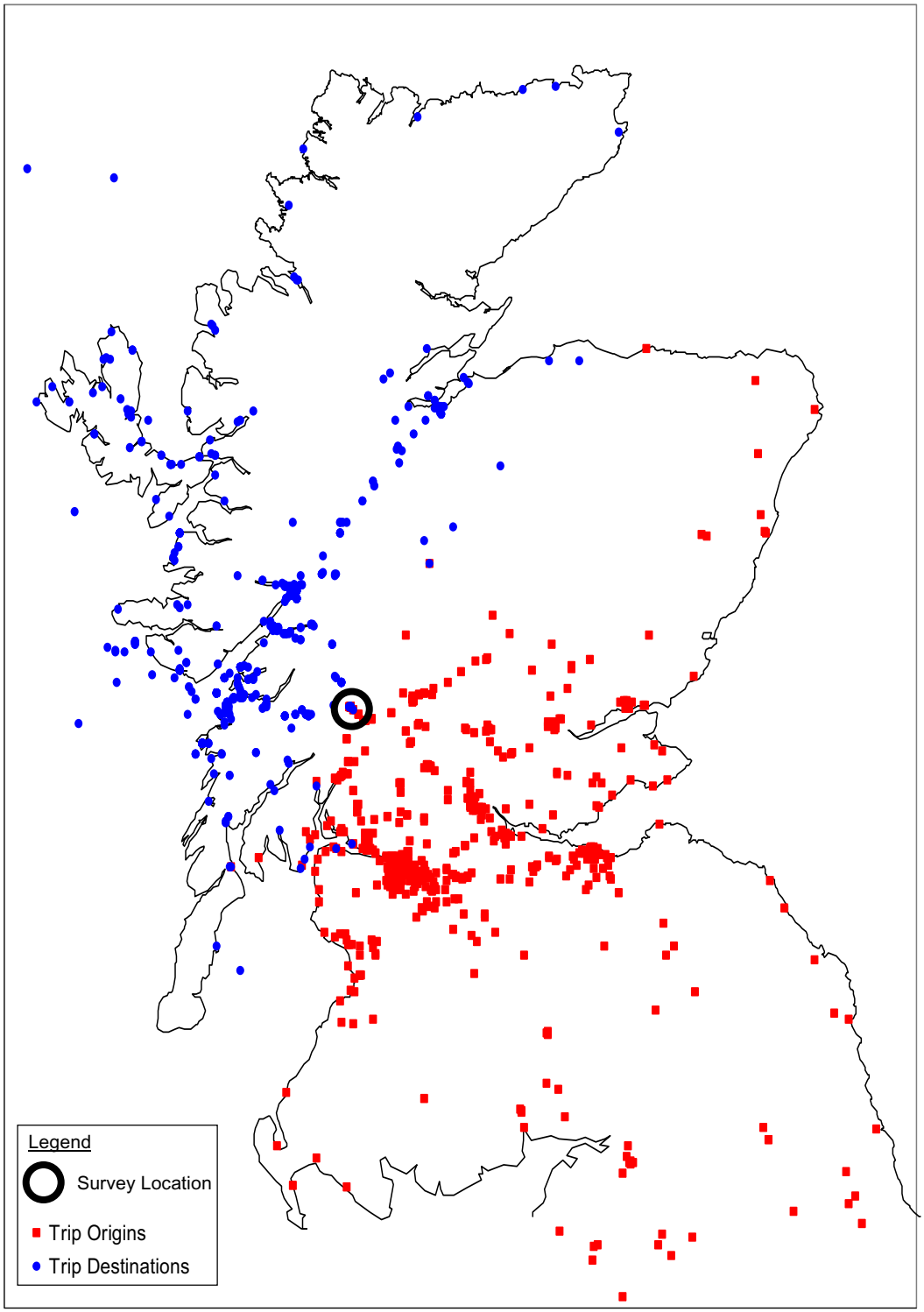

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Figure 3.5a
RSI Trip Patterns
Site 1 Tyndrum
August 2004

A82 Route Action Plan
RSI Trip Patterns Site 2 Onich Aug 2004 (Scotland)

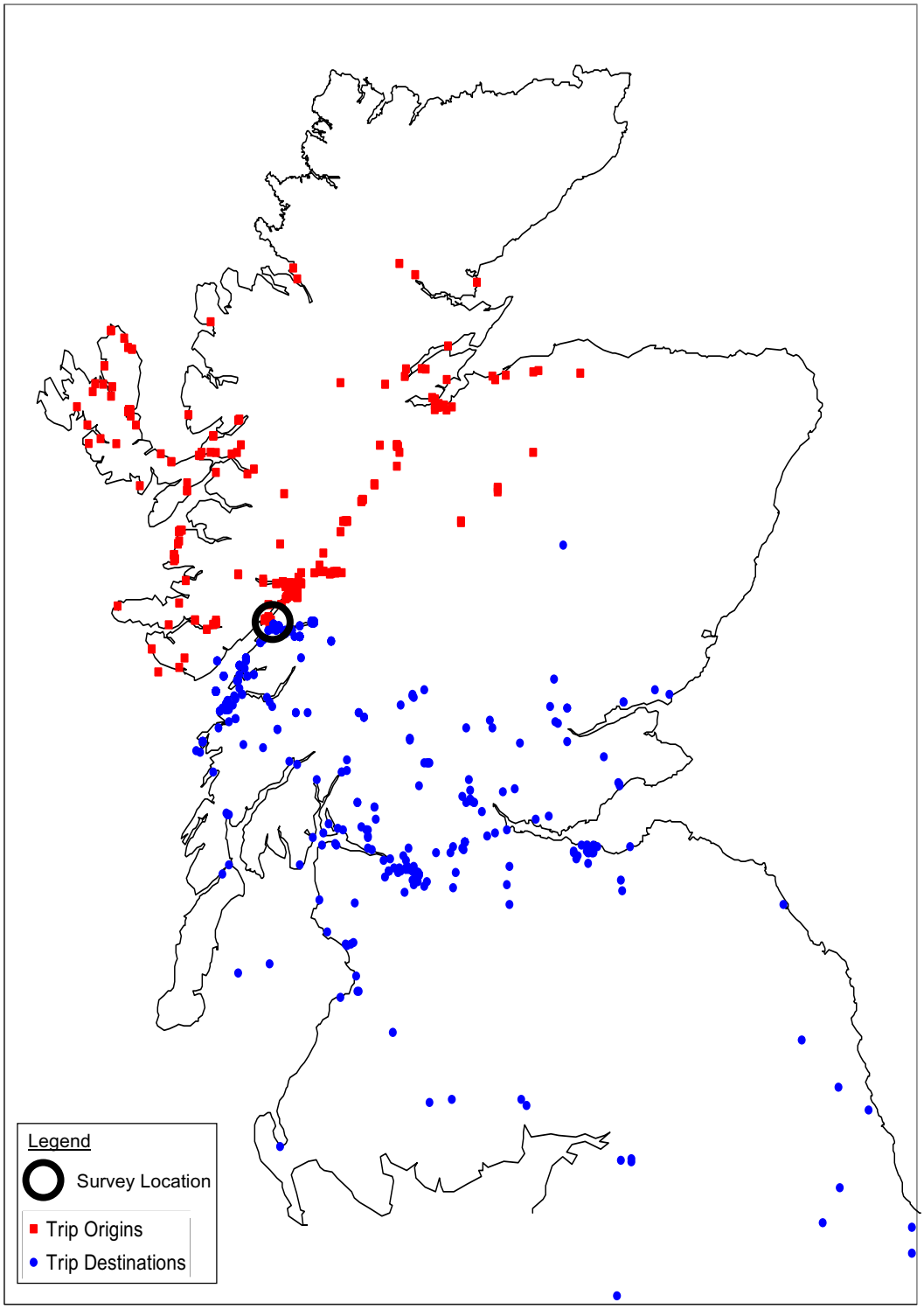

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Figure 3.5b
RSI Trip Patterns
Site 2 Onich
August 2004

A82 Route Action Plan
RSI Trip Patterns Site 1 Tyndrum Sept 2004 (Scotland)

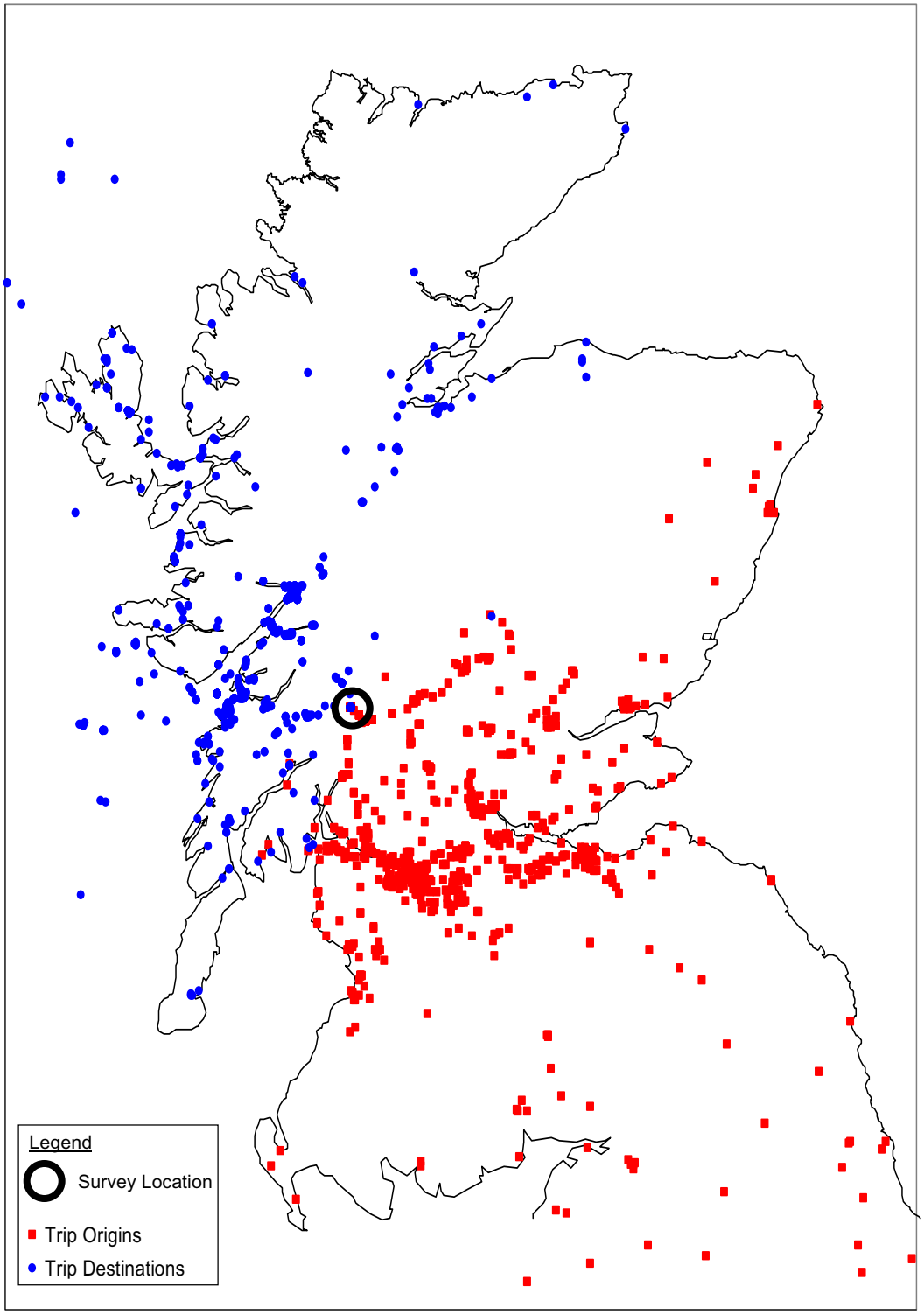

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Figure 3.5c
RSI Trip Patterns
Site 1 Tyndrum
September 2004

A82 Route Action Plan
RSI Trip Patterns Site 2 Ballachulish Sept 04 (Scotland)

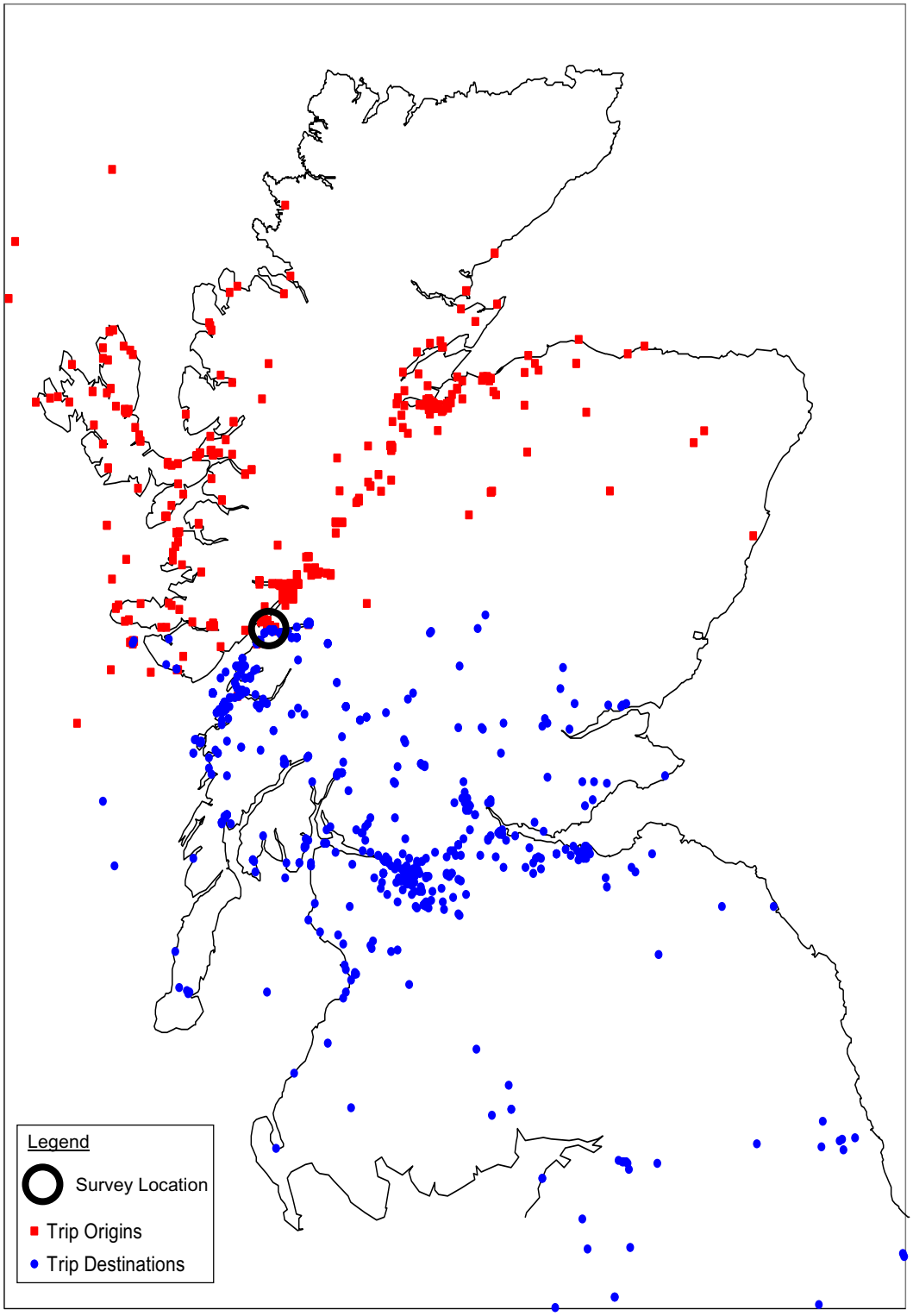

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Figure 3.5d
RSI Trip Patterns
Site 2 Ballachulish
September 2004

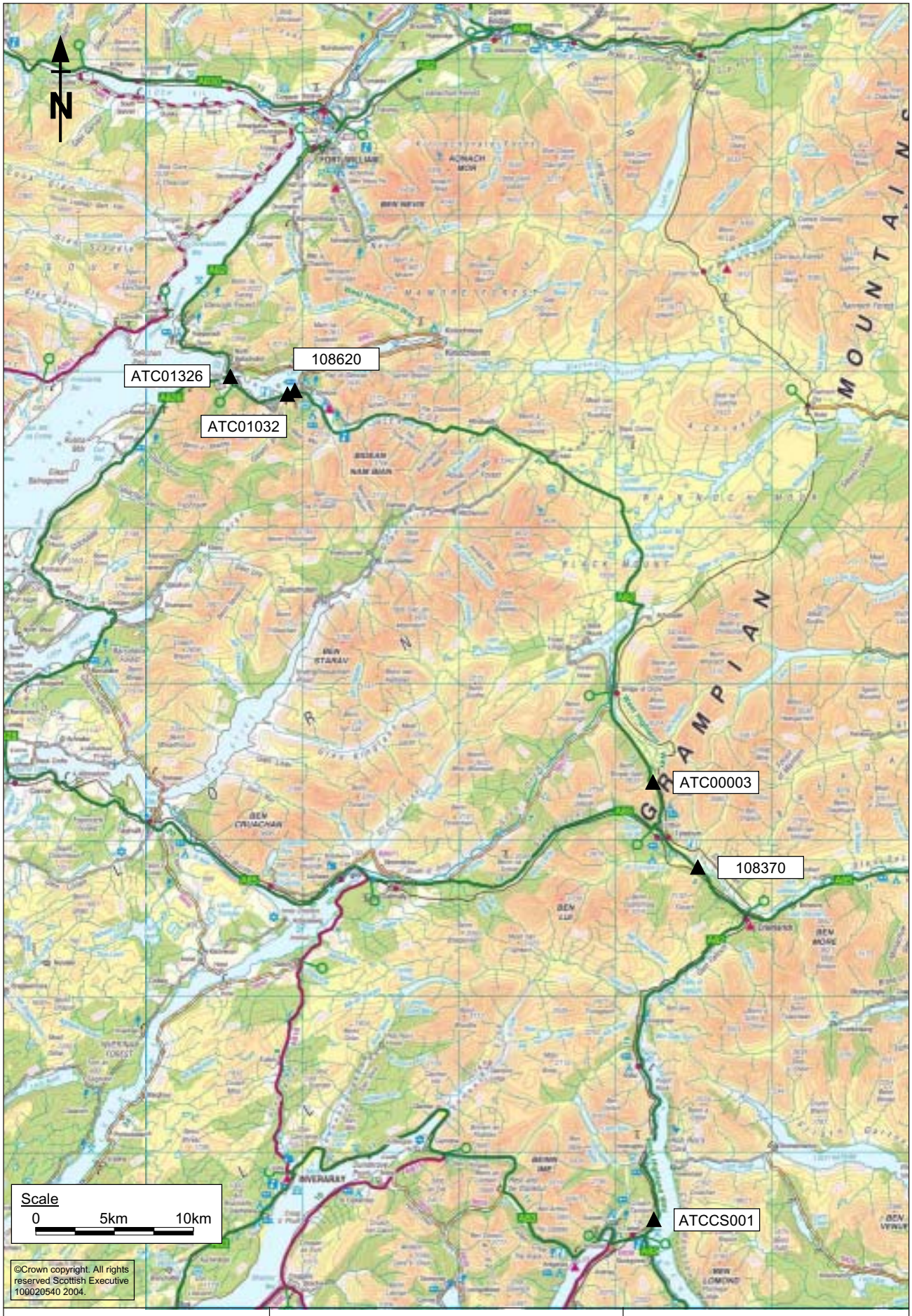

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Figure 3.6
Location of Long Term Automatic Traffic Counters

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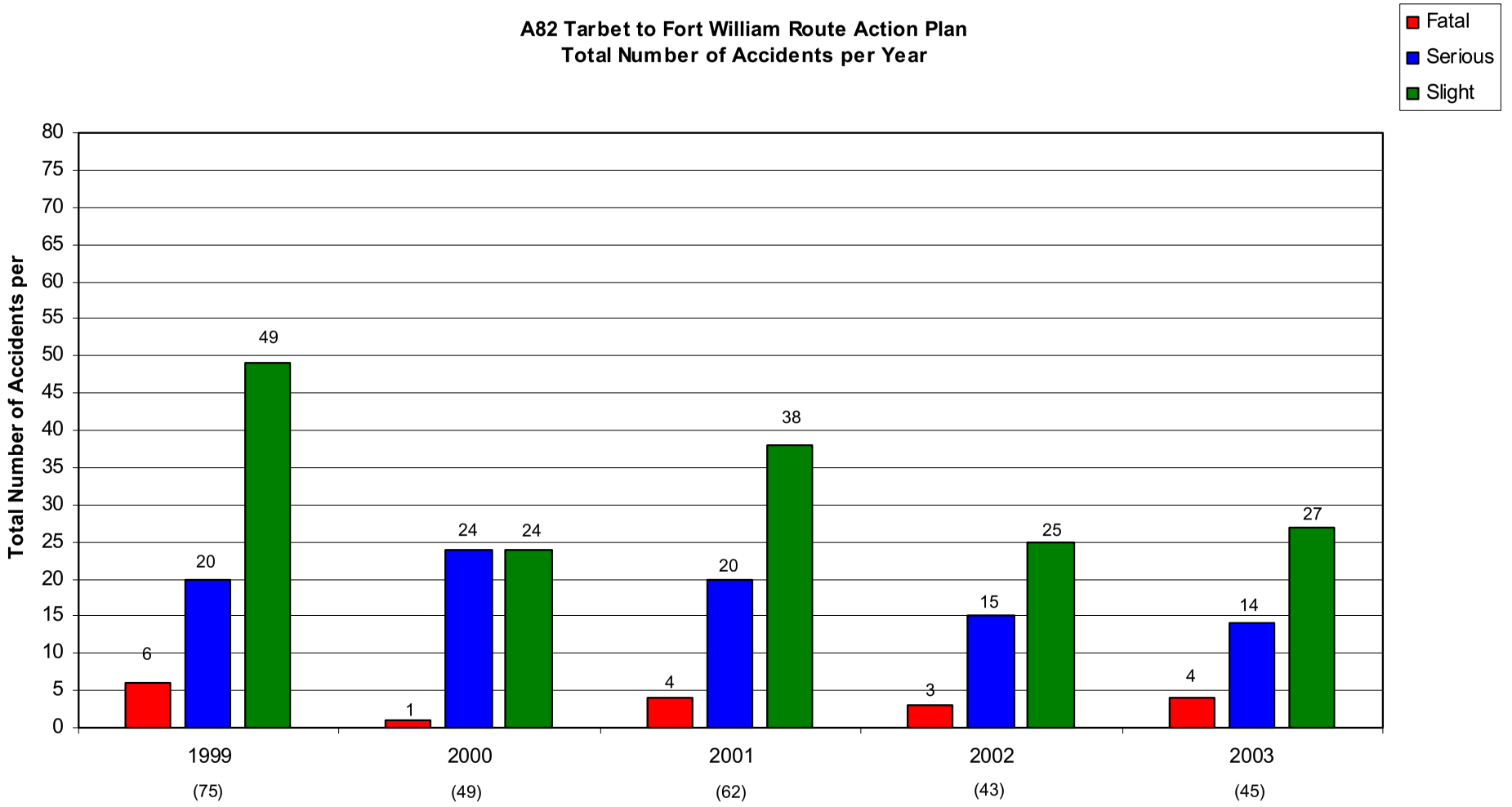
Total Number of Accidents per Year



TOTAL 18 93 163 = 274

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Figure 3.7
Accident Severity

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Analysis of Accidents per km (1999-2003)

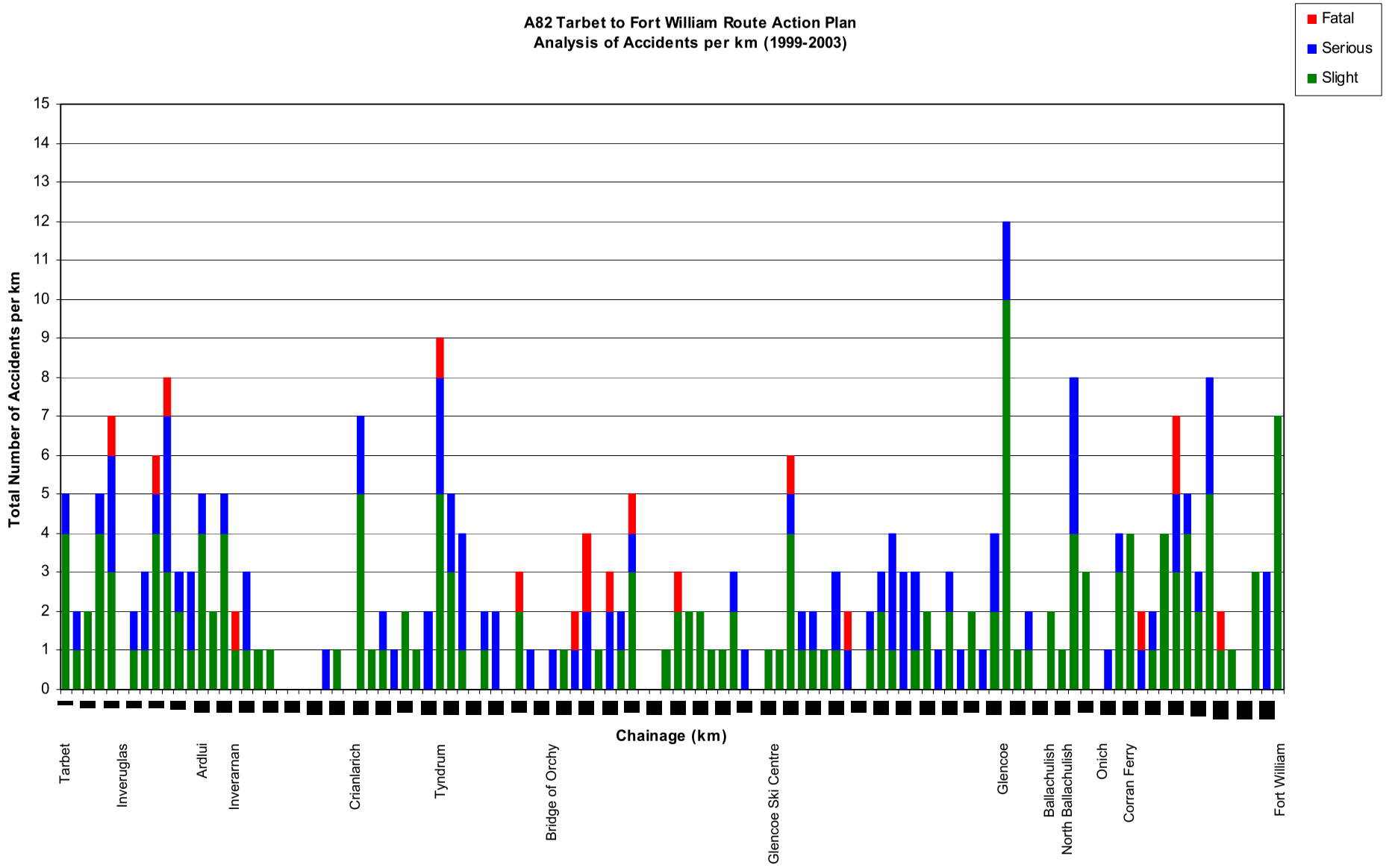

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Figure 3.8
Total Number and Severity of Accidents

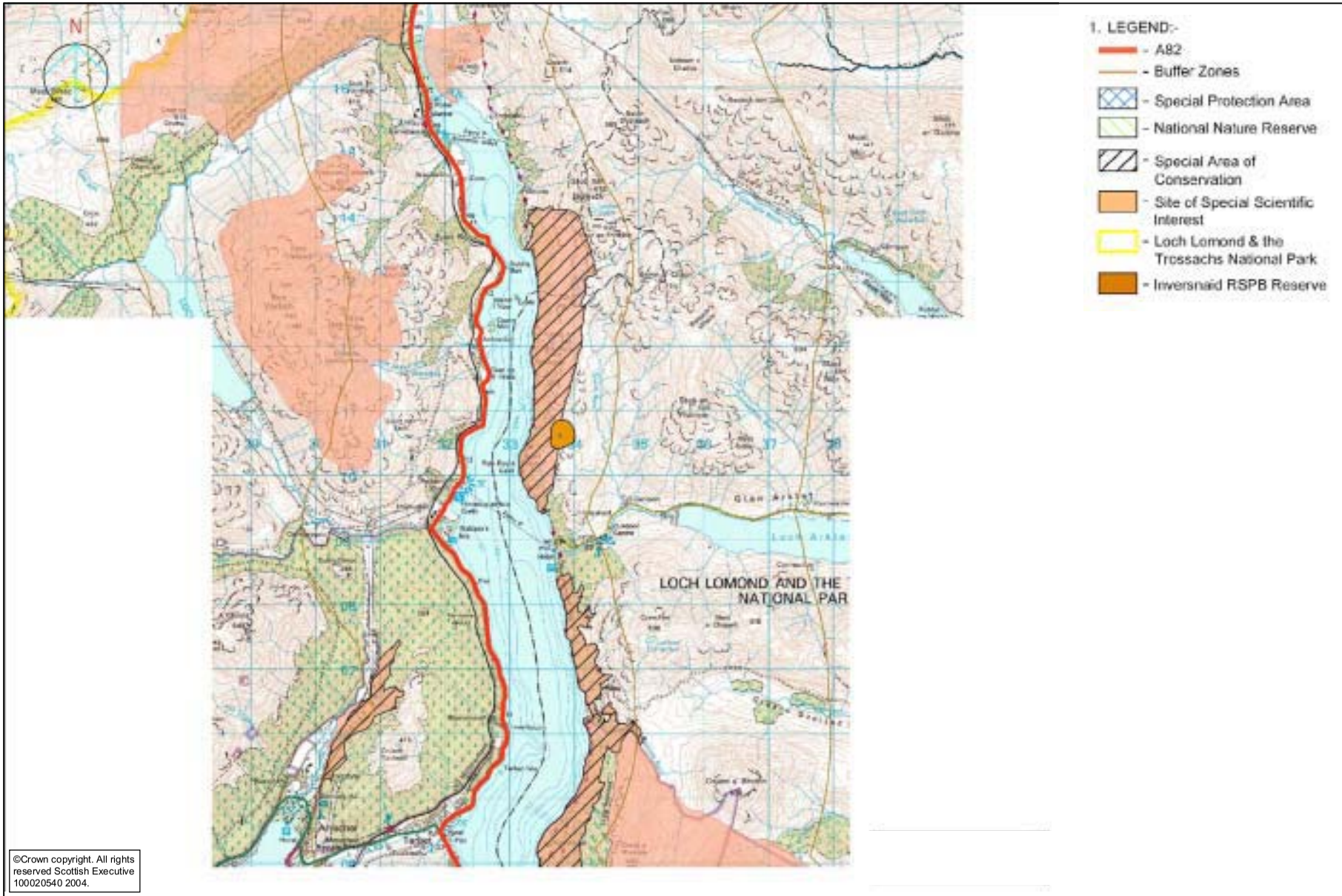

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Figure 3.9a
Ecological Designations

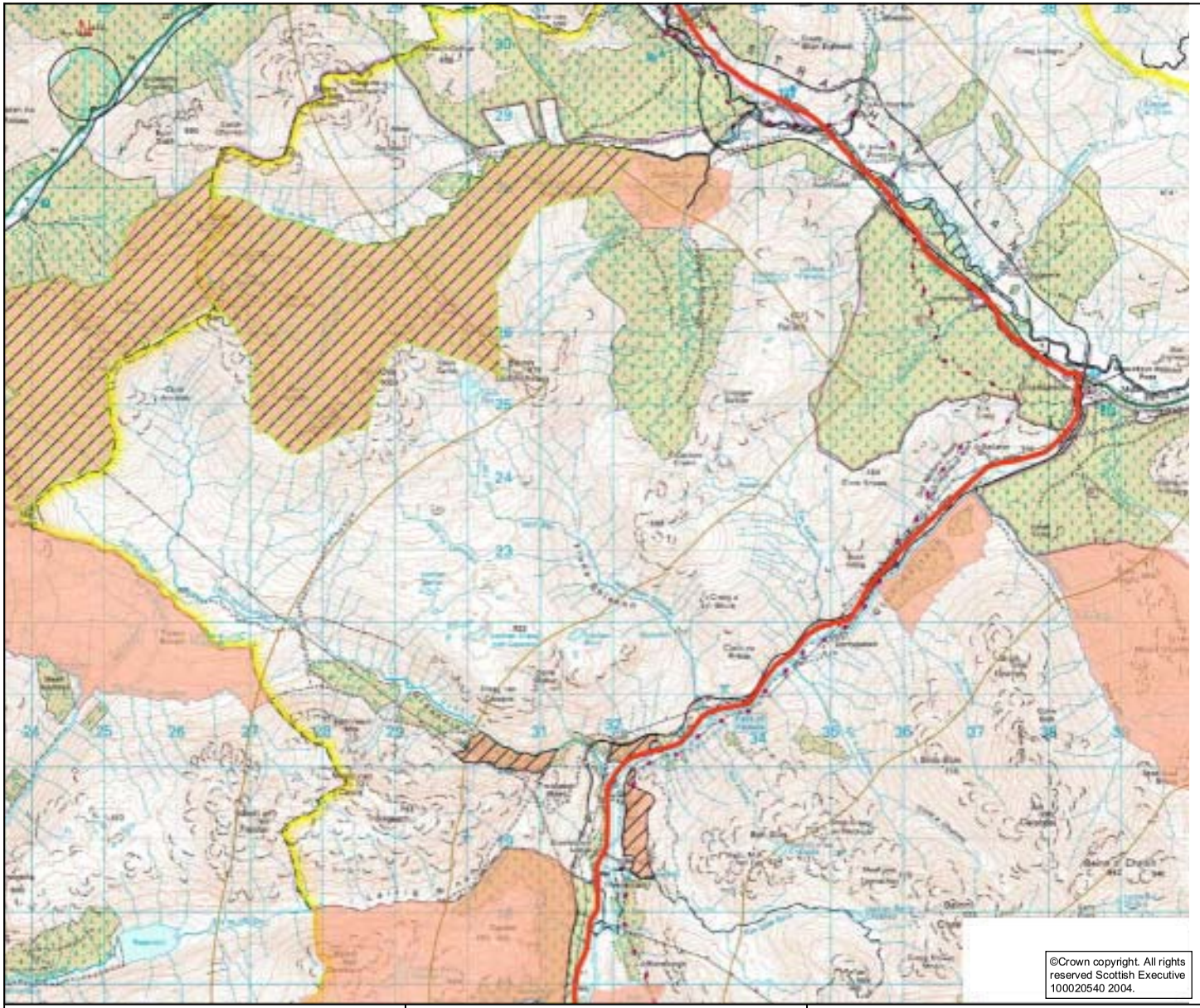

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Figure 3.9b
Ecological Designations

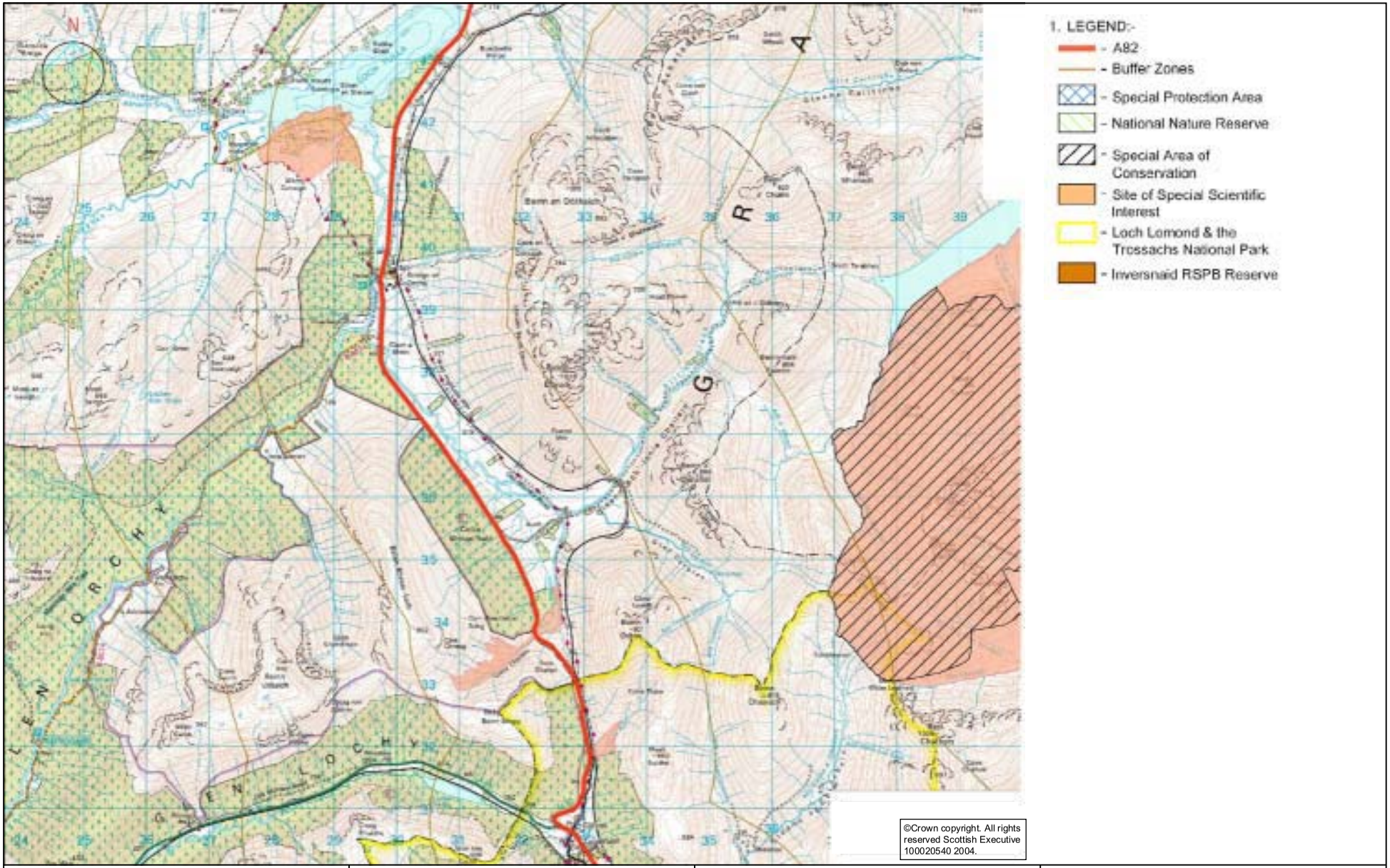

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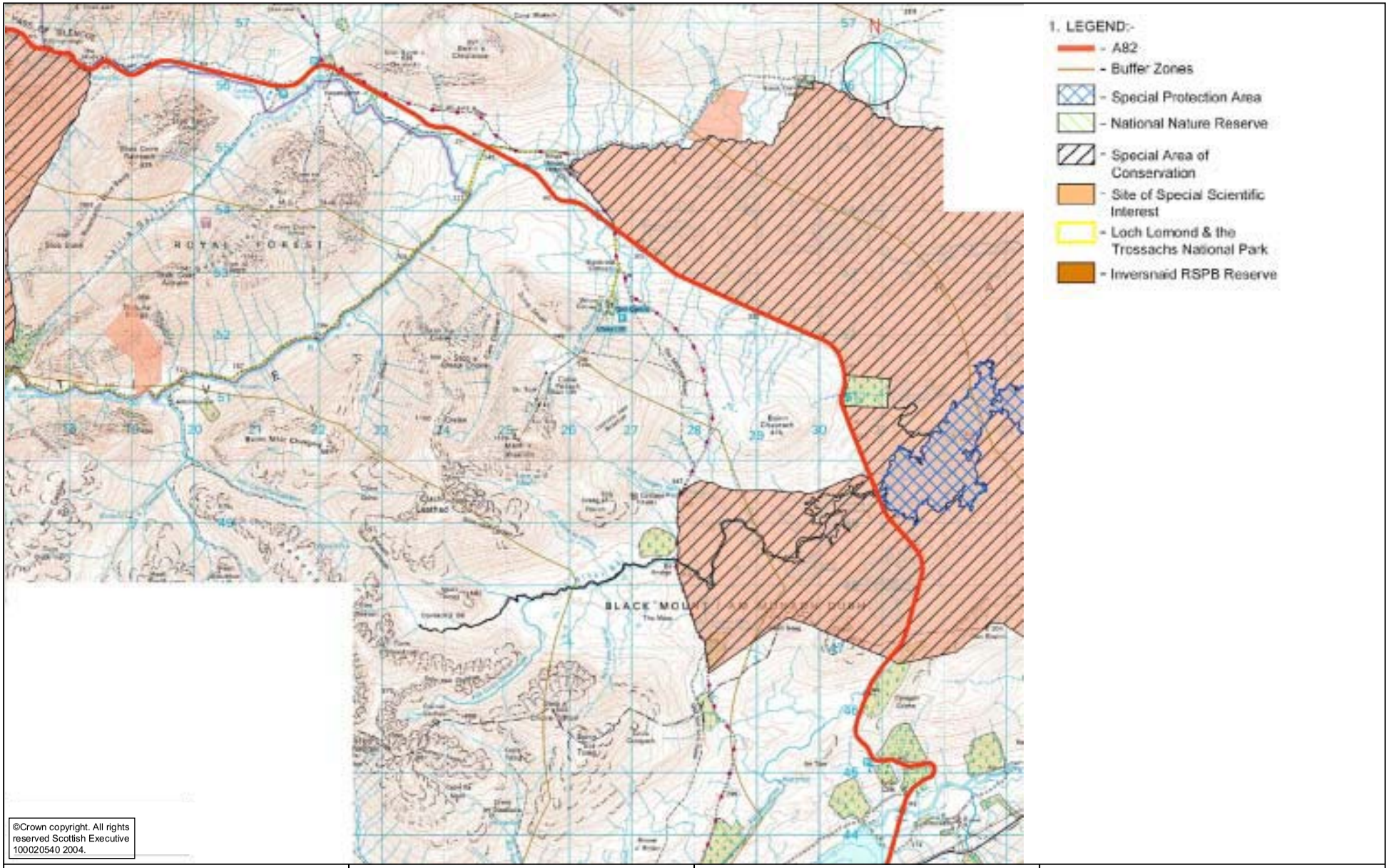
Figure 3.9c
Ecological Designations



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Notes:

A82 Tarbet to Fort William Route Action Plan Study Firm Strategy Report

Figure 3.9d
Ecological Designations

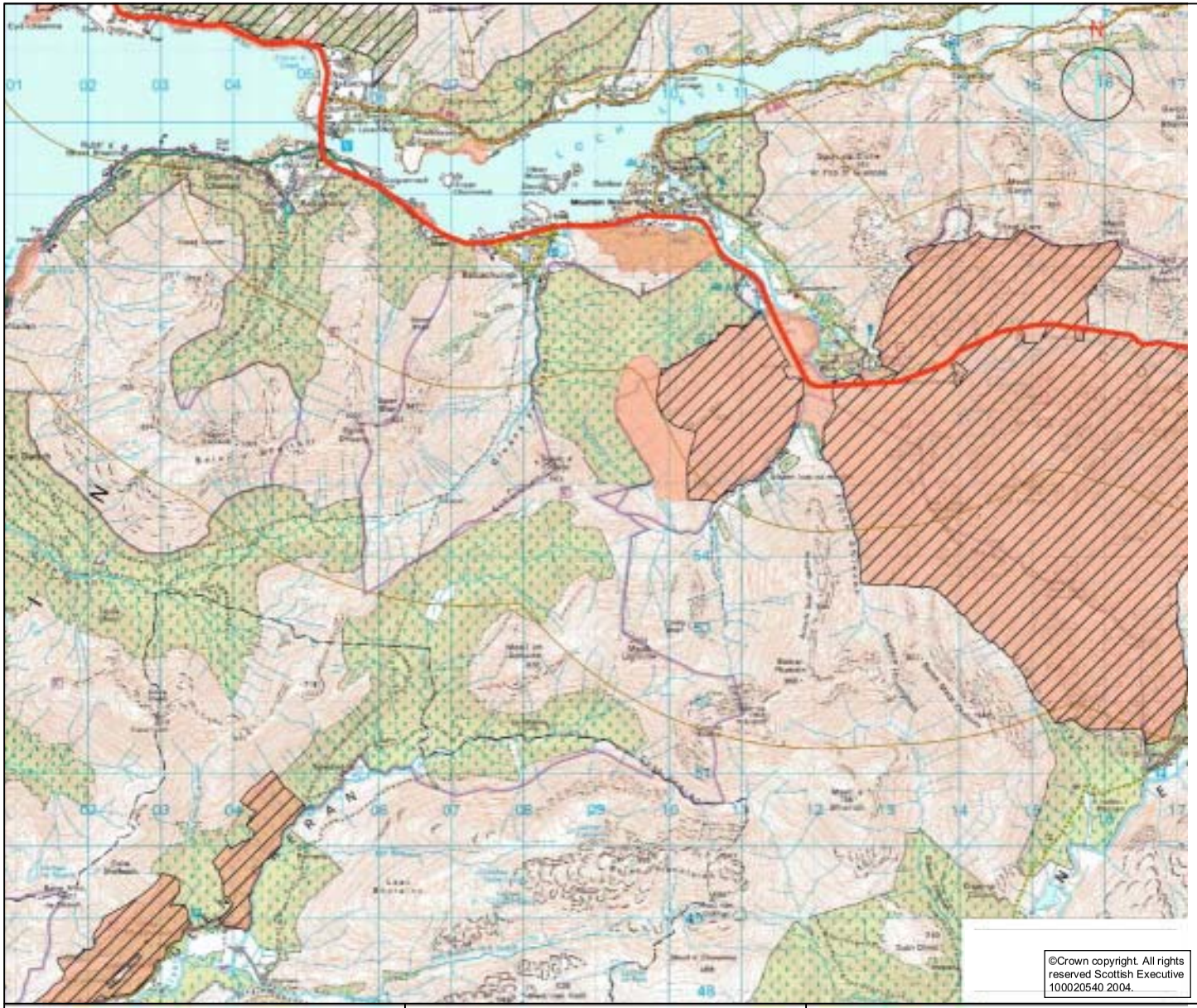

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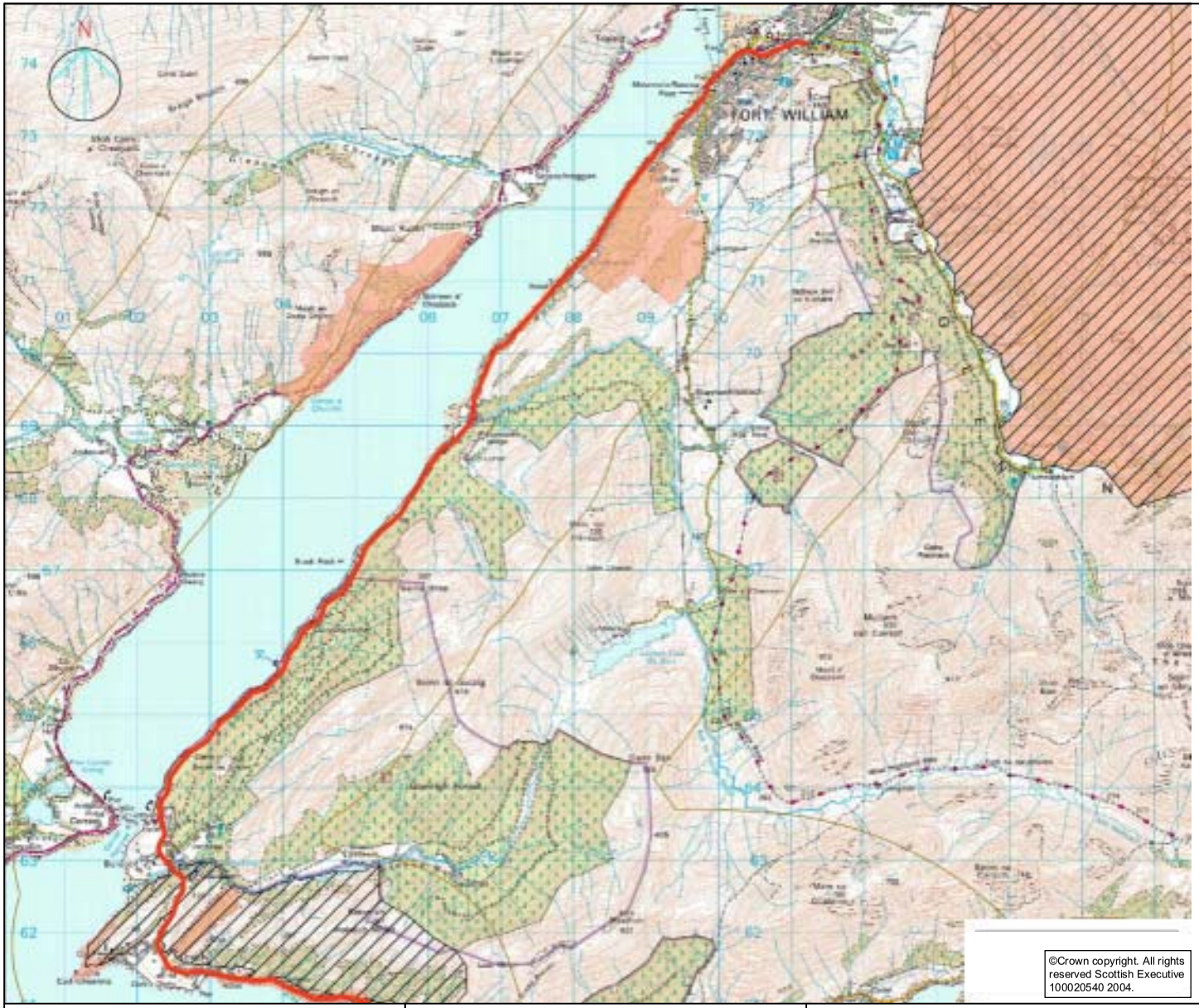
Figure 3.9e
Ecological Designations



1. LEGEND:-
- A82
- Buffer Zones
- Special Protection Area
- National Nature Reserve
- Special Area of Conservation
- Site of Special Scientific Interest
- Loch Lomond & the Trossachs National Park
- Inversnaid RSPB Reserve

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Figure 3.9f
Ecological Designations

4. APPROACH TO ASSESSMENT

4.1 Engineering Assessment

For the purpose of the engineering assessment, only indicative layouts have been developed using OS mapping.

For the on-line improvement options along Loch Lomond and Loch Linnhe, it has been assumed that any new scheme would be constructed within the existing corridor by widening the existing carriageway. For the off-line improvement options elsewhere along the route, indicative layouts were prepared.

The horizontal geometry of the existing road was determined based on the available OS mapping, however only limited data are available on vertical curvature. No information has been identified to confirm the available carriageway width expect from on-site observations.

Given the level of traffic on the route, it has been assumed that at-grade junctions would be provided.

4.2 Traffic and Economic Assessment

The quantitative assessment of the transport economic efficiency and road safety aspects of a proposed road improvement requires the development and application of various computer models. In the case of the A82 Tarbet to Fort William appraisal, this has involved the development of a NESA (Network Evaluation from Surveys and Assignments) model supported by a QUADRO (Queues and Delays at Roadworks) model.

- The NESA model was developed to compare the cost and road user benefits of the proposed improvements taking account of both transport economic efficiency and road safety issues; and
- The QUADRO model was developed to examine the delays and costs associated with the construction works and future road maintenance requirements.

The NESA Model

NESA is the standard computer program used extensively on a wide range of projects throughout Scotland to examine proposed investments in the trunk road network by comparing the costs of the road improvements with the associated road user benefits. The procedures for developing and applying the NESA model are set out in the Design Manual for Roads and Bridges (DMRB) Volume 15.

The results of the NESA models presented in this report have been used to assist in the development of the route action plan for the A82 trunk road. A more detailed NESA appraisal will be required to define more fully the economic benefits of each scheme relative to the associated costs.

For the purpose of the economic appraisal only, it has been assumed that construction works could commence in 2008 and would generally extend for up to three years for individual schemes. Further appraisals will be required to examine the effects of delivering a programme of improvements when a firm strategy has been defined.

At this stage, the traffic forecast is based on the central default growth projection, which is considered to provide a reasonable estimate of long term future traffic growth in the strategic A82 corridor. For the purpose of the economic appraisal, the default accident rates provided in the NESA program have been adopted.

The preliminary cost estimates that have been used in the cost benefits assessments are based on the application of typical unit rates per kilometre only, and are therefore likely to change as more information becomes available. As there is a tendency for project appraisers to be overly optimistic, the preliminary cost estimates for the schemes have been increased by 44% to reflect optimism bias. However, in accordance with current guidelines, an economic assessment based on 25% optimism bias has also been undertaken.

The QUADRO Model

QUADRO (Queues and Delays at Roadworks) is the standard computer program used to assess the works costs and road user delay costs associated with undertaking a programme of future maintenance under both the do-minimum and do-something scenarios and the road user delay costs associated with the construction of the scheme options.

The procedures for developing and applying the QUADRO model are set out in the Design Manual for Roads and Bridges (DMRB) Volume 14.

4.3 Environmental Assessment

Environmental Impact Assessment is a process for assessing the likely environmental consequences of development as an integral part of the planning and design process. This process is required to be carried out under European Legislation set out in Chapter 14 Legal Requirements.

It should be noted that although the key environmental issues have been considered, a full Stage 1 Assessment in accordance with the guidelines set out in Volume 11 of the Design Manual for Roads and Bridges, will be required.

The purpose of the initial assessment of impacts is to both identify and resolve issues at an early stage and assist with the further development of the route options between Tarbet and Fort William. In relation to each of the improvement options, the environmental assessment focuses on the following:

- Major issues of key concern which require careful consideration and development of strategies to address them;
- Issues of lesser concern that can be overcome through minor modifications to initial design and consideration of mitigation opportunities; and
- Issues that can be demonstrated to be insignificant.

5. ASSESSMENT OF ROUTE IMPROVEMENT OPTIONS

5.1 Tarbet to South of Pulpit Rock (6.0m)

Description of Improvement Scheme

The improvement option involves the provision of a new, generally on-line 10.3 kilometre long single 2-lane carriageway extending from the A82/A83 Tarbet junction at route chainage 0.0 kilometres to the south of Pulpit Rock at route chainage 10.6 kilometres. The improvement is based on a 6.0 metre wide carriageway with 1.0 metre wide hard strips and 2.5 metre wide verges, with an overall width of 13.0 metres.

An alternative proposal based on the provision of a 7.3 metre wide carriageway with 1.0 metre wide hard strips and 2.5 metre wide verges, with a total width of 14.3 metres, is also being considered but is dependent upon the operational, economic and environmental impacts.

The general location of the improvement option is shown in Figure 5.1.

Scheme Cost Estimate

The indicative cost estimates that were used as the basis of the economic appraisal of the improvement option, based on mid-2005 prices and excluding VAT, are summarised below:

- Excluding Optimism Bias £26.1m (approx. £2.5m / km)
- Including 44% Optimism Bias £37.5m (approx. £3.6m / km)
- Including 25% Optimism Bias £32.6m (approx. £3.2m / km)

For the purpose of the economic appraisal only, it has been assumed that 30%, 34%, 33% of the costs would be spent in the years 2008, 2009 and 2010 respectively, with a final 3% in the 2011 year of opening.

Engineering Assessment

It should be noted that the assessment of this section builds on the work carried out to develop a previous alignment. Route options are based on relatively small scale mapping and a further engineering assessment based on more detailed topographical survey will be required to confirm the feasibility of providing full standard carriageway on this section.

Due to the constrained alignment of the A82 over this length, there will be the requirement for extensive lengths of rock cut or retaining walls.

Construction of this length of improved carriageway will present significant challenges, involving difficult topography, tight constraints and some significant structures.

The lack of local diversion routes along Loch Lomond is likely to present considerable traffic management challenges that will inevitably result in significant delays to road users and disruption to the local community.

A more detailed assessment of engineering conditions will be required as the improvement option is developed, with a full assessment in accordance with DMRB being undertaken thereafter.

Environmental Assessment

Overall there are a number of potential impacts identified that will require to be considered at later stages in the process of assessment. The most significant is the potential impacts fall broadly into impacts on protected species and their habitats and secondly the landscape and visual impacts and within the vicinity of the proposed route. Any impact on the integrity of either an individual species or its habitat is considered to be significant. In addition we have highlighted potential major landscape effects resulting from loss of woodland and the design and alignment which would cut across the grain of the landscape. Finally the assessment has identified potentially major changes to the view from the road owing to loss of woodland and uniformity of design.

Key environmental issues:

- Direct loss of ancient woodland habitat.
- Indirect impacts on ancient woodland as a result of severance.
- Road alignment encroaching into Loch Lomond.
- Impacts on watercourses.
- Potential impacts on water vole and otter if present along watercourses.
- Potential impacts on bats, red squirrel, wild cat and pine marten if present.
- Potential impacts on herptiles (Slow worm, Common Lizard and Adder if present.
- Potential major adverse landscape and visual effects.
- Potential major landscape effects resulting from loss of woodland and the design and alignment which would cut across the grain of the landscape.
- Potential major changes to the view from the road owing to loss of woodland and uniformity of design.

An overall appraisal summary of the Tarbet to south of Pulpit Rock improvement option is shown in Table 5.1a.

Table 5.1a - Overall appraisal summary

Sector	Assessment	Appraisal of Impact
Noise Vibration & Air Quality	Neutral adverse impact Quality	Neutral
Water quality	Potentially minor adverse impact	Minor
Ecology	Potentially significant adverse impact	Major
Geology, landuse, agriculture and soils	Neutral impact	Neutral
Landscape and Visual	Major adverse impact	Major
Cultural Heritage	Neutral environmental impacts	Neutral

Operational Assessment

The information from the traffic model indicates that the 2-way 24-hour Annual Average Daily Traffic Flow on this section of the A82 is 2993 vehicles per day (vpd) in 2004. Through the application of national road traffic forecasts, based on the central growth projections, traffic flows could increase to 3335 vpd in the 2011 Opening Year and 3961 vpd in the 2026 Design Year.

Examination of the results from the traffic model indicates that the journey time over this section of the A82 in 2011 would equate to 11.8 minutes. The proposed improvement option would decrease journey times to 7.3 minutes, which equates to a saving of 4.5 minutes or 38% in the 2011 year of opening.

There are no over-capacity links or over-capacity junctions on this section of the A82 in the do-minimum and the do-something networks.

The results from the traffic models indicate that the proposed improvement option would deliver the following savings in the numbers of Personal Injury Accidents (PIAs):

- PIA savings in the 2011 Year of Opening 1.7
- PIA savings in the 2026 Design Year 2.6
- PIA savings over 60-year scheme life 157.4

Economic Assessment

The results from the NESA model indicate that the proposed improvement option would generate a positive economic return.

During the calibration of the do-minimum model, it was noted that the speeds derived from the journey time surveys were slower than the modelled speeds based on the measured geometry of the route. An adjustment factor was therefore applied to the measured geometry to improve the calibration of the do-minimum network

modelled speeds. The economic assessment of the improvement option is therefore based on the measured geometry of the do-something network against the calibrated do-minimum network. To maintain consistency between the do-minimum and the do-something networks, a second do-something network was created whereby the measured geometry for the do-something network was also adjusted by the same factor. The results from both assessments are presented in this report.

The results obtained from the NESA model indicate that the total consumer and business user benefits associated with the improvement option equate to £43.12 and £42.47m based on the measured and the adjusted geometry respectively. Savings in road traffic accidents equate to benefits of £4.60m. This information is summarised in Table 5.1b.

Table 5.1b – NESA Appraisal Tarbet to South of Pulpit Rock (6.0m)

	44% OB Meas	**44% OB Adj**	**25% OB Meas**	**25% OB Adj**
Consumer User Benefits	22.41	22.08	22.41	22.08
Business Benefits	20.71	20.39	20.71	20.39
Private Sector Provider Impacts	0.26	0.26	0.26	0.26
Accident Benefits	4.60	4.60	4.60	4.60
Present Value of Benefits	**47.98**	**47.33**	**47.98**	**47.33**
Government Funding (Present Value of Costs)	**38.81**	**38.88**	**33.73**	**33.80**
Overall Impact				
Net Present Value	**9.17**	**8.45**	**14.25**	**13.53**
Benefit to Cost Ratio	**1.24**	**1.22**	**1.42**	**1.40**

Note: Costs in 2002 Prices in £m discounted to 2002 at 3.5% discount rate for 30-year evaluation thereafter 3.0% for 46 years thereafter 2.5%.

The results obtained from the QUADRO model to assess the cost of delays during construction and future maintenance works are summarised in Table 5.1c.

Table 5.1c – QUADRO Appraisal Tarbet to South of Pulpit Rock (6.0m)

	20% OB	**10% OB**
Present Value of Benefits During Construction	-0.31	-0.28
Present Value of Benefits During Future Maintenance	0.02	0.02
Present Value of Cost	-1.65	-1.65
Net Present Value	1.36	1.38

Note: Costs in £m in 2002 Prices discounted to 2002 at 3.5% discount rate for 30-year evaluation and 3.0% thereafter.

The results from the QUADRO model indicate that delays during construction would equate to between £0.31m and £0.28m depending on the level of duration optimism bias, with Net Present Values (NPVs) of between £1.36m and £1.38m for 20% and 10% optimism bias respectively.

The overall economic appraisal of the improvement option in market prices, based on the combined NESA and QUADRO appraisals and the application of NRTF (1997) central traffic growth projection, is shown in Table 5.1d.

Table 5.1d – Combined NESA/QUADRO Appraisal Tarbet to South of Pulpit Rock (6.0m)

	44% OB Meas.	**44% OB Adj.**	**25% OB Meas.**	**25% OB Adj.**
Present Value of Benefits (£m)	47.69	47.04	47.71	47.06
Present Value of Cost (£m)	37.16	37.23	32.08	32.15
Net Present Value (£m)	10.53	9.81	15.63	14.91
Benefit to Cost Ratio	1.28	1.26	1.49	1.46

Note: Costs in 2002 Prices in £m discounted to 2002

Based on the combined NESA and QUADRO results, the NPVs of the scheme would range from £9.81m to £15.63m, with corresponding BCRs ranging from 1.26 to 1.49.

5.2 Tarbet to South of Pulpit Rock (7.3m)

Description of Improvement Scheme

The improvement option involves the provision of a new, generally on-line 10.3 kilometre long single 2-lane carriageway extending from the A82/A83 Tarbet junction at route chainage 0.0 kilometres to the south of Pulpit Rock at route chainage 10.6 kilometres. The improvement is based on a 7.3 metre wide carriageway with 1.0 metre wide hard strips and 2.5 metre wide verges, with an overall width of 14.3 metres.

Scheme Cost Estimate

The indicative cost estimates that were used as the basis of the economic appraisal of the improvement option, based on mid-2005 prices and excluding VAT, are summarised below:

- Excluding Optimism Bias £33.5m (approx. £3.3m / km)
- Including 44% Optimism Bias £48.3m (approx. £4.7m / km)
- Including 25% Optimism Bias £42.0m (approx. £4.1m / km)

For the purpose of the economic appraisal only, it has been assumed that 30%, 34%, 33% of the costs would be spent in the years 2008, 2009 and 2010 respectively, with a final 3% in the 2011 year of opening.

Engineering Assessment

The key engineering effects of this option are considered to be broadly in line with the effects of the 6.0m wide option.

Environmental Assessment

The key environmental effects of this option are considered to be broadly in line with the effects of the 6.0m wide option.

Operational Assessment

The information from the traffic model indicates that the 2-way 24-hour Annual Average Daily Traffic Flow on this section of the A82 is 2993 vehicles per day (vpd) in 2004. Through the application of national road traffic forecasts, based on the central growth projections, traffic flows could increase to 3335 vpd in the 2011 Opening Year and 3961 vpd in the 2026 Design Year.

Examination of the results from the traffic model indicates that the journey time over this section of the A82 in 2011 would equate to 11.8 minutes. The proposed improvement option would decrease journey times to 7.1 minutes, which equates to a saving of 4.7 minutes or 40% in the 2011 year of opening.

There are no over-capacity links or over-capacity junctions on this section of the A82 in the do-minimum and the do-something networks.

The results from the traffic models indicate that the proposed improvement option would deliver the following savings in the numbers of Personal Injury Accidents (PIAs):

- PIA savings in the 2011 Year of Opening 1.7
- PIA savings in the 2026 Design Year 2.6
- PIA savings over 60-year scheme life 157.4

Economic Assessment

The results from the NESA model indicate that the proposed improvement option would generate a positive economic return.

During the calibration of the do-minimum model, it was noted that the speeds derived from the journey time surveys were slower than the modelled speeds based on the measured geometry of the route. An adjustment factor was therefore applied to the measured geometry to improve the calibration of the do-minimum network modelled speeds. The economic assessment of the improvement option is therefore based on the measured geometry of the do-something network against the calibrated do-minimum network. To maintain consistency between the do-minimum and the do-something networks, a second do-something network was created whereby the measured geometry for the do-something network was also adjusted by the same factor. The results from both assessments are presented in this report.

The results obtained from the NESA model indicate that the total consumer and business user benefits associated with the improvement option equate to £44.63 and £44.04m based on the measured and the adjusted geometry respectively. Savings in road traffic accidents equate to benefits of £4.60m. This information is summarised in Table 5.2a.

Table 5.2a – NESA Appraisal Tarbet to South of Pulpit Rock (7.3m)

	44% OB Meas	**44% OB Adj**	**25% OB Meas**	**25% OB Adj**
Consumer User Benefits	23.14	22.85	23.14	22.85
Business Benefits	21.49	21.19	21.49	21.19
Private Sector Provider Impacts	0.26	0.26	0.26	0.26
Accident Benefits	4.60	4.60	4.60	4.60
Present Value of Benefits	**49.49**	**48.90**	**49.49**	**48.90**
Government Funding (Present Value of Costs)	**49.69**	**49.77**	**43.16**	**43.24**
Overall Impact				
Net Present Value	**-0.20**	**-0.87**	**6.33**	**5.66**
Benefit to Cost Ratio	**1.00**	**0.98**	**1.15**	**1.13**

Note: Costs in 2002 Prices in £m discounted to 2002 at 3.5% discount rate for 30-year evaluation thereafter 3.0% for 46 years thereafter 2.5%.

The results obtained from the QUADRO model to assess the cost of delays during construction and future maintenance works are summarised in Table 5.2b.

Table 5.2b – QUADRO Appraisal Tarbet to South of Pulpit Rock (7.3m)

	20% OB	**10% OB**
Present Value of Benefits During Construction	-0.31	-0.28
Present Value of Benefits During Future Maintenance	0.02	0.02
Present Value of Cost	-1.65	-1.65
Net Present Value	1.36	1.38

Note: Costs in £m in 2002 Prices discounted to 2002 at 3.5% discount rate for 30-year evaluation and 3.0% thereafter.

The results from the QUADRO model indicate that delays during construction would equate to between £0.31m and £0.28m depending on the level of duration optimism bias, with Net Present Values (NPVs) of between £1.36m and £1.38m for 20% and 10% optimism bias respectively.

The overall economic appraisal of the improvement option in market prices, based on the combined NESA and QUADRO appraisals and the application of NRTF (1997) central traffic growth projection, is shown in Table 5.2c.

Table 5.2c – Combined NESA/QUADRO Appraisal Tarbet to South of Pulpit Rock (7.3m)

	44% OB Meas.	**44% OB Adj.**	**25% OB Meas.**	**25% OB Adj.**
Present Value of Benefits (£m)	49.20	48.61	49.22	48.63
Present Value of Cost (£m)	48.04	48.12	41.51	41.59
Net Present Value (£m)	1.16	0.49	7.71	7.04
Benefit to Cost Ratio	1.02	1.01	1.19	1.17

Note: Costs in 2002 Prices in £m discounted to 2002

Based on the combined NESA and QUADRO results, the NPVs of the scheme would range from £0.49m to £7.71m, with corresponding BCRs ranging from 1.01 to 1.19**.**

5.3 Pulpit Rock (6.0m)

Description of Improvement Scheme

The improvement option involves the provision of a new off-line 0.35 kilometre long single 2-lane carriageway extending from south of Pulpit Rock at route chainage 10.6 kilometres to the north of Pulpit Rock at route chainage 11.0 kilometres. The improvement, which includes a 200 metre long tunnel through rock, is based on a 6.0 metre wide carriageway with 1.0 metre wide hard strips and 1.0 metre wide verges, with an overall width of 10.0 metres.

An alternative proposal based on the provision of a 7.3 metre wide carriageway with 1.0 metre wide hard strips and 1.0 metre wide verges, with a total width of 11.3 metres, is also being considered but is dependent upon the operational, economic and environmental impacts.

The general location of the improvement option is shown in Figure 5.2.

Scheme Cost Estimate

The indicative cost estimates that were used as the basis of the economic appraisal of the improvement option, based on mid-2005 prices and excluding VAT, are summarised below:

- Excluding Optimism Bias £4.5m (approx. £12.9m / km)
- Including 44% Optimism Bias £6.5m (approx. £18.6m / km)
- Including 25% Optimism Bias £5.6m (approx. £16.0m / km)

For the purpose of the economic appraisal only, it has been assumed that 97% of the costs would be spent in the year 2008 respectively, with a final 3% in the 2009 year of opening.

Engineering Assessment

It should be noted that the assessment of this section builds on the work carried out to develop a previous alignment. Route options are based on relatively small scale mapping and a further engineering assessment based on more detailed topographical survey will be required to confirm the feasibility of providing full standard carriageway on this section.

This options concentres on the provision of a new tunnel through some 200m of rock in the vicinity of Pulpit Rock.

The lack of local diversion routes along Loch Lomond is likely to present considerable traffic management challenges that will inevitably result in significant delays to road users and disruption to the local community.

A more detailed assessment of engineering conditions will be required as the improvement option is developed, with a full assessment in accordance with DMRB being undertaken thereafter.

Environmental Assessment

Overall the focus of impacts centre around protected species and their habitats and the protection of waterbodies on Loch Lomond. Impacts on the landscape and visual impacts is assessed as being of a lesser extent and focused upon the loss of existing semi-natural broad leaved woodland. Any impact on the integrity of either an individual species or its habitat is considered to be significant.

Key environmental issues:

- Loss of semi-natural broad-leaved woodland.
- Impacts on waterbodies (Loch Lomond).

An overall appraisal summary of the Pulpit Rock improvement option is shown in Table 5.3a.

Table 5.3a - Overall appraisal summary

Sector	Assessment	Appraisal of Impact
Noise, vibration and air quality	Positive Moderate impact	Positive
Water quality	Potentially minor adverse impact	Minor
Ecology	Potentially minor adverse impact	Minor
Geology, landuse, agriculture and soils	Neutral impact	Neutral
Landscape and Visual	Minor adverse impact during construction; short term moderate adverse impacts; long term slight adverse impact	Minor
Cultural Heritage	Neutral impacts	Neutral

Operational Assessment

The information from the traffic model indicates that the 2-way 24-hour Annual Average Daily Traffic Flow on this section of the A82 is 2993 vehicles per day (vpd) in 2004. Through the application of national road traffic forecasts, based on the central growth projections, traffic flows could increase to 3237 vpd in the 2009 Opening Year and 3892 vpd in the 2024 Design Year.

Examination of the results from the traffic model indicates that the journey time over this section of the A82 in 2009 would equate to 0.6 minutes. The proposed improvement option would decrease journey times to 0.2 minutes, which equates to a saving of 0.4 minutes or 67% in the 2009 year of opening.

There are no over-capacity links or over-capacity junctions on this section of the A82 in the do-minimum and the do-something networks.

The results from the traffic models indicate that the proposed improvement option would deliver the following savings in the numbers of Personal Injury Accidents (PIAs):

- PIA savings in the 2009 Year of Opening 0.1
- PIA savings in the 2024 Design Year 0.1
- PIA savings over 60-year scheme life 6.1

Economic Assessment

The results from the NESA model indicate that the proposed improvement option would generate a positive economic return.

During the calibration of the do-minimum model, it was noted that the speeds derived from the journey time surveys were slower than the modelled speeds based on the measured geometry of the route. An adjustment factor was therefore applied to the measured geometry to improve the calibration of the do-minimum network modelled speeds. The economic assessment of the improvement option is therefore based on the measured geometry of the do-something network against the calibrated do-minimum network. To maintain consistency between the do-minimum and the do-something networks, a second do-something network was created whereby the measured geometry for the do-something network was also adjusted by the same factor. The results from both assessments are presented in this report.

The results obtained from the NESA model indicate that the total consumer and business user benefits associated with the improvement option equate to £3.06 and £3.08m based on the measured and the adjusted geometry respectively. Savings in road traffic accidents equate to benefits of £0.22m. This information is summarised in Table 5.3b.

Table 5.3b – NESA Appraisal Pulpit Rock (6.0m)

	44% OB Meas	**44% OB Adj**	**25% OB Meas**	**25% OB Adj**
Consumer User Benefits	1.60	1.61	1.60	1.61
Business Benefits	1.46	1.47	1.46	1.47
Private Sector Provider Impacts	0.02	0.02	0.02	0.02
Accident Benefits	0.22	0.22	0.22	0.22
Present Value of Benefits	**3.30**	**3.32**	**3.30**	**3.32**
Government Funding (Present Value of Costs)	**6.94**	**6.94**	**6.02**	**6.02**
Overall Impact				
Net Present Value	**-3.63**	**-3.62**	**-2.72**	**-2.70**
Benefit to Cost Ratio	**0.48**	**0.48**	**0.55**	**0.55**

Note: Costs in 2002 Prices in £m discounted to 2002 at 3.5% discount rate for 30-year evaluation thereafter 3.0% for 46 years thereafter 2.5%.

The results obtained from the QUADRO model to assess the cost of delays during construction and future maintenance works are summarised in Table 5.3c.

Table 5.3c – QUADRO Appraisal Pulpit Rock (6.0m)

	20% OB	**10% OB**
Present Value of Benefits During Construction	0.00	0.00
Present Value of Benefits During Future Maintenance	-0.02	-0.02
Present Value of Cost	-0.04	-0.04
Net Present Value	0.02	0.02

Note: Costs in £m in 2002 Prices discounted to 2002 at 3.5% discount rate for 30-year evaluation and 3.0% thereafter.

The results from the QUADRO model indicate that delays during construction would equate to £0.00m depending on the level of duration optimism bias, with a Net Present Value (NPV) of £0.02m for both 20% and 10% optimism bias.

The overall economic appraisal of the improvement option in market prices, based on the combined NESA and QUADRO appraisals and the application of NRTF (1997) central traffic growth projection, is shown in Table 5.3d.

Table 5.3d – Combined NESA/QUADRO Appraisal Pulpit Rock (6.0m)

	44% OB Meas.	**44% OB Adj.**	**25% OB Meas.**	**25% OB Adj.**
Present Value of Benefits (£m)	3.28	3.30	3.28	3.30
Present Value of Cost (£m)	6.90	6.90	5.99	5.99
Net Present Value (£m)	-3.62	-3.60	-2.70	-2.68
Benefit to Cost Ratio	0.48	0.48	0.55	0.55

Note: Costs in 2002 Prices in £m discounted to 2002

Based on the combined NESA and QUADRO results, the NPVs of the scheme would range from -£3.62m to -£2.68m, with corresponding BCRs ranging from 0.48 to 0.55.

5.4 Pulpit Rock (7.3m)

Description of Improvement Scheme

The improvement option involves the provision of a new off-line 0.35 kilometre long single 2-lane carriageway extending from south of Pulpit Rock at route chainage 10.6 kilometres to the north of Pulpit Rock at route chainage 11.0 kilometres. The improvement, which includes a 200 metre long tunnel through rock, is based on a 7.3 metre wide carriageway with 1.0 metre wide hard strips and 1.0 metre wide verges, with an overall width of 10.0 metres.

Scheme Cost Estimate

The indicative cost estimates that were used as the basis of the economic appraisal of the improvement option, based on mid-2005 prices and excluding VAT, are summarised below:

- Excluding Optimism Bias £5.1m (approx. £14.3m / km)
- Including 44% Optimism Bias £7.3m (approx. £20.9m / km)
- Including 25% Optimism Bias £6.3m (approx. £18.0m / km)

For the purpose of the economic appraisal only, it has been assumed that 97% of the costs would be spent in the year 2008 respectively, with a final 3% in the 2009 year of opening.

Engineering Assessment

The key engineering effects of this option are considered to be broadly in line with the effects of the 6.0m wide option.

Environmental Assessment

The key environmental effects of this option are considered to be broadly in line with the effects of the 6.0m wide option.

Operational Assessment

The information from the traffic model indicates that the 2-way 24-hour Annual Average Daily Traffic Flow on this section of the A82 is 2993 vehicles per day (vpd) in 2004. Through the application of national road traffic forecasts, based on the central growth projections, traffic flows could increase to 3237 vpd in the 2009 Opening Year and 3892 vpd in the 2024 Design Year.

Examination of the results from the traffic model indicates that the journey time over this section of the A82 in 2009 would equate to 0.6 minutes. The proposed improvement option would decrease journey times to 0.2 minutes, which equates to a saving of 0.4 minutes or 67% in the 2009 year of opening.

There are no over-capacity links or over-capacity junctions on this section of the A82 in the do-minimum and the do-something networks.

The results from the traffic models indicate that the proposed improvement option would deliver the following savings in the numbers of Personal Injury Accidents (PIAs):

- PIA savings in the 2009 Year of Opening 0.1
- PIA savings in the 2024 Design Year 0.1
- PIA savings over 60-year scheme life 6.1

Economic Assessment

The results from the NESA model indicate that the proposed improvement option would generate a positive economic return.

During the calibration of the do-minimum model, it was noted that the speeds derived from the journey time surveys were slower than the modelled speeds based on the measured geometry of the route. An adjustment factor was therefore applied to the measured geometry to improve the calibration of the do-minimum network modelled speeds. The economic assessment of the improvement option is therefore based on the measured geometry of the do-something network against the calibrated do-minimum network. To maintain consistency between the do-minimum and the do-something networks, a second do-something network was created whereby the measured geometry for the do-something network was also adjusted by the same factor. The results from both assessments are presented in this report.

The results obtained from the NESA model indicate that the total consumer and business user benefits associated with the improvement option equate to £3.11 and £3.12m based on the measured and the adjusted geometry respectively. Savings in road traffic accidents equate to benefits of £0.22m. This information is summarised in Table 5.4a.

Table 5.4a – NESA Appraisal Pulpit Rock (7.3m)

	44% OB Meas	**44% OB Adj**	**25% OB Meas**	**25% OB Adj**
Consumer User Benefits	1.62	1.63	1.62	1.63
Business Benefits	1.49	1.49	1.49	1.49
Private Sector Provider Impacts	0.02	0.02	0.02	0.02
Accident Benefits	0.22	0.22	0.22	0.22
Present Value of Benefits	**3.35**	**3.37**	**3.35**	**3.37**
Government Funding (Present Value of Costs)	**7.78**	**7.78**	**6.76**	**6.75**
Overall Impact				
Net Present Value	**-4.42**	**-4.41**	**-3.41**	**-3.38**
Benefit to Cost Ratio	**0.43**	**0.43**	**0.50**	**0.50**

Note: Costs in 2002 Prices in £m discounted to 2002 at 3.5% discount rate for 30-year evaluation thereafter 3.0% for 46 years thereafter 2.5%.

The results obtained from the QUADRO model to assess the cost of delays during construction and future maintenance works are summarised in Table 5.4b.

Table 5.4b – QUADRO Appraisal Pulpit Rock (7.3m)

	20% OB	**10% OB**
Present Value of Benefits During Construction	0.00	0.00
Present Value of Benefits During Future Maintenance	-0.02	-0.02
Present Value of Cost	-0.04	-0.04
Net Present Value	0.02	0.02

Note: Costs in £m in 2002 Prices discounted to 2002 at 3.5% discount rate for 30-year evaluation and 3.0% thereafter.

The results from the QUADRO model indicate that delays during construction would equate to £0.00m depending on the level of duration optimism bias, with a Net Present Value (NPV) of £0.02m for both 20% and 10% optimism bias.

The overall economic appraisal of the improvement option in market prices, based on the combined NESA and QUADRO appraisals and the application of NRTF (1997) central traffic growth projection, is shown in Table 5.4c.

Table 5.4c – Combined NESA/QUADRO Appraisal Pulpit Rock (7.3m)

	44% OB Meas.	**44% OB Adj.**	**25% OB Meas.**	**25% OB Adj.**
Present Value of Benefits (£m)	3.33	3.35	3.33	3.35
Present Value of Cost (£m)	7.74	7.74	6.72	6.71
Net Present Value (£m)	-4.41	-4.39	-3.39	-3.36
Benefit to Cost Ratio	0.43	0.43	0.50	0.50

Note: Costs in 2002 Prices in £m discounted to 2002

Based on the combined NESA and QUADRO results, the NPVs of the scheme would range from -£4.41m to -£3.36m, with corresponding BCRs ranging from 0.43 to 0.50.

5.5 Pulpit Rock to Inverarnan (6.0m)

Description of Improvement Scheme

The improvement option involves the provision of a new, generally on-line 4.1 kilometre long single 2-lane carriageway extending over part of the section from the north of Pulpit Rock at route chainage 11.0 kilometres to the bridge over the River Falloch at route chainage 16.0 kilometres. The improvement is based on a 6.0 metre wide carriageway with 1.0 metre wide hard strips and 2.5 metre wide verges, with an overall width of 13.0 metres.

The improvement consists of the following elements:

- A 0.48 kilometre generally on-line section between route chainage 11.0 kilometres and route chainage 11.5 kilometres, and
- A 3.62 kilometre generally on-line section between route chainage 12.3 kilometres and chainage 16.0 kilometres.

An alternative proposal based on the provision of a 7.3 metre wide carriageway with 1.0 metre wide hard strips and 2.5 metre wide verges, with a total width of 14.3 metres, is also being considered along the above sections but is dependent upon the operational, economic and environmental impacts.

The general location of the improvement option is shown in Figure 5.3.

Scheme Cost Estimate

The indicative cost estimates that were used as the basis of the economic appraisal of the improvement option, based on mid-2005 prices and excluding VAT, are summarised below:

- Excluding Optimism Bias £6.9m (approx. £1.7m / km)
- Including 44% Optimism Bias £10.0m (approx. £2.4m / km)
- Including 25% Optimism Bias £8.7m (approx. £2.1m / km)

For the purpose of the economic appraisal only, it has been assumed that 47%, 50% of the costs would be spent in the years 2008 and 2009 respectively, with a final 3% in the 2010 year of opening.

Engineering Assessment

It should be noted that the assessment of this section builds on the work carried out to develop a previous alignment. Route options are based on relatively small scale mapping and a further engineering assessment based on more detailed topographical survey will be required to confirm the feasibility of providing full standard carriageway on this section.

Due to the constrained alignment of the A82 over this length, there will be the requirement for extensive lengths of rock cut or retaining walls.

Construction of this length of improved carriageway will present significant challenges, involving difficult topography, tight constraints and some significant structures.

The lack of local diversion routes along Loch Lomond is likely to present considerable traffic management challenges that will inevitably result in significant delays to road users and disruption to the local community.

A more detailed assessment of engineering conditions will be required as the improvement option is developed, with a full assessment in accordance with DMRB being undertaken thereafter.

Environmental Assessment

The most significant effect is the potential impacts on Loch Lomond Woods SAC. Any impact on the integrity of the SAC is considered to be significant. Equally the same logic is applied where there are potential impacts on scheduled protected species and the integrity of the Glen Falloch Wood SSSI and Geal and Dubh Lochs SSSI.

Of lesser concern is the potential direct impact of the removal of Long Established Woodland of Plantation Origin.

Key environmental issues:

- Direct loss of ancient woodland habitat.
- Impacts on watercourses.
- Road alignment encroaching into Loch Lomond.
- Potential impacts on water vole and otter if present along watercourses.
- Potential impacts on bats, red squirrel, wild cat and pine marten if present.
- Potential impacts on herptiles (Slow worm, Common Lizard and Adder if present.
- Potential landscape and visual effects resulting from the loss of woodland.

An overall appraisal summary of the Pulpit Rock to Inverarnan improvement option is shown in Table 5.5a.

Table 5.5a - Overall appraisal summary

Sector	Assessment	Appraisal of Impact
Noise, vibration and air quality	Neutral impact	Neutral
Water quality	Potentially minor adverse impact	Minor
Ecology	Potentially major adverse impact	Major
Geology, landuse, agriculture and soils	Moderate adverse impact.	Minor
Landscape and Visual	Significant adverse impact for Option C.1. Moderate /Major adverse impact on Option C.2	Major to Minor
Cultural Heritage	Neutral impacts	Neutral

Operational Assessment

The information from the traffic model indicates that the 2-way 24-hour Annual Average Daily Traffic Flow on this section of the A82 is 2993 vehicles per day (vpd) in 2004. Through the application of national road traffic forecasts, based on the central growth projections, traffic flows could increase to 3286 vpd in the 2010 Opening Year and 3927 vpd in the 2025 Design Year.

Examination of the results from the traffic model indicates that the journey time over this section of the A82 in 2010 would equate to 4.9 minutes. The proposed improvement option would decrease journey times to 3.9 minutes, which equates to a saving of 1 minute or 20% in the 2010 year of opening.

There are no over-capacity links or over-capacity junctions on this section of the A82 in the do-minimum and the do-something networks.

The results from the traffic models indicate that the proposed improvement option would deliver the following savings in the numbers of Personal Injury Accidents (PIAs):

- PIA savings in the 2010 Year of Opening 0.4
- PIA savings in the 2025 Design Year 0.7
- PIA savings over 60-year scheme life 44.8

Economic Assessment

The results from the NESA model indicate that the proposed improvement option would generate a positive economic return.

During the calibration of the do-minimum model, it was noted that the speeds derived from the journey time surveys were slower than the modelled speeds based on the measured geometry of the route. An adjustment factor was therefore applied to the measured geometry to improve the calibration of the do-minimum network modelled speeds. The economic assessment of the improvement option is therefore

based on the measured geometry of the do-something network against the calibrated do-minimum network. To maintain consistency between the do-minimum and the do-something networks, a second do-something network was created whereby the measured geometry for the do-something network was also adjusted by the same factor. The results from both assessments are presented in this report.

The results obtained from the NESA model indicate that the total consumer and business user benefits associated with the improvement option equate to £8.63 and £8.32m based on the measured and the adjusted geometry respectively. Savings in road traffic accidents equate to benefits of £1.36m. This information is summarised in Table 5.5b.

Table 5.5b – NESA Appraisal Pulpit Rock to Inverarnan (6.0m)

	44% OB Meas	**44% OB Adj**	**25% OB Meas**	**25% OB Adj**
Consumer User Benefits	4.48	4.33	4.48	4.33
Business Benefits	4.15	3.99	4.15	3.99
Private Sector Provider Impacts	0.03	0.03	0.03	0.03
Accident Benefits	1.36	1.36	1.36	1.36
Present Value of Benefits	**10.02**	**9.71**	**10.02**	**9.71**
Government Funding (Present Value of Costs)	**10.25**	**10.29**	**8.88**	**8.92**
Overall Impact				
Net Present Value	**-0.22**	**-0.58**	**1.14**	**0.79**
Benefit to Cost Ratio	**0.98**	**0.94**	**1.13**	**1.09**

Note: Costs in 2002 Prices in £m discounted to 2002 at 3.5% discount rate for 30-year evaluation thereafter 3.0% for 46 years thereafter 2.5%.

The results obtained from the QUADRO model to assess the cost of delays during construction and future maintenance works are summarised in Table 5.5c.

Table 5.5c – QUADRO Appraisal Pulpit Rock to Inverarnan (6.0m)

	20% OB	**10% OB**
Present Value of Benefits During Construction	-0.22	-0.20
Present Value of Benefits During Future Maintenance	0.01	0.01
Present Value of Cost	-0.59	-0.59
Net Present Value	0.38	0.40

Note: Costs in £m in 2002 Prices discounted to 2002 at 3.5% discount rate for 30-year evaluation and 3.0% thereafter.

The results from the QUADRO model indicate that delays during construction would equate to between £0.22m and £0.20m depending on the level of duration optimism bias, with Net Present Values (NPVs) of between £0.38m and £0.40m for 20% and 10% optimism bias respectively.

The overall economic appraisal of the improvement option in market prices, based on the combined NESA and QUADRO appraisals and the application of NRTF (1997) central traffic growth projection, is shown in Table 5.5d.

Table 5.5d – Combined NESA/QUADRO Appraisal Pulpit Rock to Inverarnan (6.0m)

	44% OB Meas.	**44% OB Adj.**	**25% OB Meas.**	**25% OB Adj.**
Present Value of Benefits (£m)	9.81	9.50	9.83	9.52
Present Value of Cost (£m)	9.66	9.70	8.29	8.33
Net Present Value (£m)	0.15	-0.20	1.54	1.19
Benefit to Cost Ratio	1.02	0.98	1.19	1.14

Note: Costs in 2002 Prices in £m discounted to 2002

Based on the combined NESA and QUADRO results, the NPVs of the scheme would range from -£0.20m to £1.54m, with corresponding BCRs ranging from 0.98 to 1.19.

5.6 Pulpit Rock to Inverarnan (7.3m)

Description of Improvement Scheme

The improvement option involves the provision of a new, generally on-line 4.1 kilometre long single 2-lane carriageway extending over part of the section from the north of Pulpit Rock at route chainage 11.0 kilometres to the bridge over the River Falloch at route chainage 16.0 kilometres. The improvement is based on a 7.3 metre wide carriageway with 1.0 metre wide hard strips and 2.5 metre wide verges, with an overall width of 13.0 metres.

The improvement consists of the following elements:

- A 0.48 kilometre generally on-line section between route chainage 11.0 kilometres and route chainage 11.5 kilometres, and
- A 3.62 kilometre generally on-line section between route chainage 12.3 kilometres and chainage 16.0 kilometres.

Scheme Cost Estimate

The indicative cost estimates that were used as the basis of the economic appraisal of the improvement option, based on mid-2005 prices and excluding VAT, are summarised below:

- Excluding Optimism Bias £9.5m (approx. £2.3m / km)
- Including 44% Optimism Bias £13.7m (approx. £3.3m / km)
- Including 25% Optimism Bias £11.8m (approx. £2.9m / km)

For the purpose of the economic appraisal only, it has been assumed that 47%, 50% of the costs would be spent in the years 2008 and 2009 respectively, with a final 3% in the 2010 year of opening.

Engineering Assessment

The key engineering effects of this option are considered to be broadly in line with the effects of the 6.0m wide option.

Environmental Assessment

The key environmental effects of this option are considered to be broadly in line with the effects of the 6.0m wide option.

Operational Assessment

The information from the traffic model indicates that the 2-way 24-hour Annual Average Daily Traffic Flow on this section of the A82 is 2993 vehicles per day (vpd) in 2004. Through the application of national road traffic forecasts, based on the

central growth projections, traffic flows could increase to 3286 vpd in the 2010 Opening Year and 3927 vpd in the 2025 Design Year.

Examination of the results from the traffic model indicates that the journey time over this section of the A82 in 2010 would equate to 4.9 minutes. The proposed improvement option would decrease journey times to 3.9 minutes, which equates to a saving of 1 minute or 20% in the 2010 year of opening.

There are no over-capacity links or over-capacity junctions on this section of the A82 in the do-minimum and the do-something networks.

The results from the traffic models indicate that the proposed improvement option would deliver the following savings in the numbers of Personal Injury Accidents (PIAs):

- PIA savings in the 2010 Year of Opening 0.4
- PIA savings in the 2025 Design Year 0.7
- PIA savings over 60-year scheme life 44.8

Economic Assessment

The results from the NESA model indicate that the proposed improvement option would generate a positive economic return.

During the calibration of the do-minimum model, it was noted that the speeds derived from the journey time surveys were slower than the modelled speeds based on the measured geometry of the route. An adjustment factor was therefore applied to the measured geometry to improve the calibration of the do-minimum network modelled speeds. The economic assessment of the improvement option is therefore based on the measured geometry of the do-something network against the calibrated do-minimum network. To maintain consistency between the do-minimum and the do-something networks, a second do-something network was created whereby the measured geometry for the do-something network was also adjusted by the same factor. The results from both assessments are presented in this report.

The results obtained from the NESA model indicate that the total consumer and business user benefits associated with the improvement option equate to £9.21 and £8.92m based on the measured and the adjusted geometry respectively. Savings in road traffic accidents equate to benefits of £1.36m. This information is summarised in Table 5.6a.

Table 5.6a – NESA Appraisal Pulpit Rock to Inverarnan (7.3m)

	44% OB Meas	44% OB Adj	25% OB Meas	25% OB Adj
Consumer User Benefits	4.76	4.62	4.76	4.62
Business Benefits	4.45	4.30	4.45	4.30
Private Sector Provider Impacts	0.03	0.03	0.03	0.03
Accident Benefits	1.36	1.36	1.36	1.36
Present Value of Benefits	**10.60**	**10.31**	**10.60**	**10.31**
Government Funding (Present Value of Costs)	**14.02**	**14.07**	**12.14**	**12.19**
Overall Impact				
Net Present Value	**-3.42**	**-3.75**	**-1.54**	**-1.88**
Benefit to Cost Ratio	**0.76**	**0.73**	**0.87**	**0.85**

Note: Costs in 2002 Prices in £m discounted to 2002 at 3.5% discount rate for 30-year evaluation thereafter 3.0% for 46 years thereafter 2.5%.

The results obtained from the QUADRO model to assess the cost of delays during construction and future maintenance works are summarised in Table 5.6b.

Table 5.6b – QUADRO Appraisal Pulpit Rock to Inverarnan (7.3m)

	20% OB	10% OB
Present Value of Benefits During Construction	-0.22	-0.20
Present Value of Benefits During Future Maintenance	0.01	0.01
Present Value of Cost	-0.59	-0.59
Net Present Value	0.38	0.40

Note: Costs in £m in 2002 Prices discounted to 2002 at 3.5% discount rate for 30-year evaluation and 3.0% thereafter.

The results from the QUADRO model indicate that delays during construction would equate to between £0.22m and £0.20m depending on the level of duration optimism bias, with Net Present Values (NPVs) of between £0.38m and £0.40m for 20% and 10% optimism bias respectively.

The overall economic appraisal of the improvement option in market prices, based on the combined NESA and QUADRO appraisals and the application of NRTF (1997) central traffic growth projection, is shown in Table 5.6c.

Table 5.6c – Combined NESA/QUADRO Appraisal Pulpit Rock to Inverarnan (7.3m)

	44% OB Meas.	44% OB Adj.	25% OB Meas.	25% OB Adj.
Present Value of Benefits (£m)	10.39	10.10	10.41	10.12
Present Value of Cost (£m)	13.43	13.48	11.55	11.60
Net Present Value (£m)	-3.04	-3.38	-1.14	-1.48
Benefit to Cost Ratio	0.77	0.75	0.90	0.87

Note: Costs in 2002 Prices in £m discounted to 2002

Based on the combined NESA and QUADRO results, the NPVs of the scheme would range from -£3.38m to -£1.14m, with corresponding BCRs ranging from 0.75 to 0.90.

5.7 Crianlarich Bypass

Description of Improvement Scheme

Previous studies have considered the requirement for a bypass of Crianlarich where significant delays can occur at the A82/A85 priority junction and at the two railway bridges. A bypass of Crianlarich would improve the existing A82 trunk road and, by removing through traffic, would allow the introduction of improved facilities for the local community.

The improvement option involves the provision of a new, generally off-line 0.77 kilometre long single 2-lane carriageway from the south of Crianlarich at route chainage 26.2 kilometres to the north of the village at route chainage 27.1 kilometres. The improvement is based on a 7.3 metre wide carriageway with 1.0 metre wide hard strips and 2.5 metre wide verges, with an overall width of 14.3 metres.

The improvement consists of the following elements:

- A 0.18 kilometre generally off-line section extending from the A82 tie-in at route chainage 26.2 kilometres, which is approximately 0.4 kilometres north of the speed limit change to the south of Crianlarich, to the new roundabout;
- A new 4-arm roundabout with a 45 metre inscribed circle diameter situated to the south of Crianlarich;
- A 0.46 kilometre off-line section extending from the new roundabout to the new priority junction;
- A new priority junction situated 0.11 kilometres south of the existing speed limit change;
- A 0.07 kilometre generally off-line section extending from the new priority junction to tie into the A82;
- Realignment of the A82 from the existing A82/A85 priority junction to tie into the new roundabout; and
- A new access road from the new roundabout to the railway station.

The general location of the improvement option is shown in Figure 5.4.

Scheme Cost Estimate

The indicative cost estimates that were used as the basis of the economic appraisal of the improvement option, based on mid-2005 prices and excluding VAT, are summarised below:

- Excluding Optimism Bias £3.1m (approx. £4.0m / km)
- Including 44% Optimism Bias £4.4m (approx. £5.7m / km)
- Including 25% Optimism Bias £3.8m (approx. £4.9m / km)

For the purpose of the economic appraisal only, it has been assumed that 97% of the costs would be spent in the year 2008 respectively, with a final 3% in the 2009 year of opening.

Engineering Assessment

The options for the construction of a Crianlarich Bypass were examined in some detail as part of a previous study. Construction of this length of improved carriageway to bypass the village should not therefore present a major challenge, although further investigations of the local topography will be required.

The provision of the existing routes should help to minimise the delays to road users and disruption to the local community.

A more detailed assessment of engineering conditions will be required as the improvement option is developed, with a full assessment in accordance with DMRB being undertaken thereafter.

Environmental Assessment

Taken as a whole there are a number of potential impacts identified that will require to be considered at later stages in the process of assessment. The most significant potential impact with the greatest consequence that will affect the integrity River Fillan which constitutes part of the River Tay SAC. Any impact on the integrity of the SAC is considered to be significant and therefore careful consideration given in development of the strategy for this part of the route. Equally the same logic is applied where there are potential impacts on scheduled protected species.

Key environmental issues:

- Impacts on watercourses.
- Potential impacts on water vole and otter if present along watercourses.
- Potential minor landscape and visual effects

An overall appraisal summary of the Crianlarich Bypass improvement option is shown in Table 5.7a.

Table 5.7a - Overall appraisal summary

Sector	Assessment	Appraisal of Impact
Noise, vibration and air quality	Neutral impact	Neutral
Water quality	Potentially neutral adverse impact	Neutral
Ecology	Potentially minor adverse impact	Minor
Geology, landuse, agriculture and soils	Minor adverse impact.	Minor
Landscape and Visual	Minor adverse impacts	Minor
Cultural Heritage	Neutral impacts	Neutral

Operational Assessment

The information from the traffic model indicates that the 2-way 24-hour Annual Average Daily Traffic Flow on this section of the A82 is 5512 vehicles per day (vpd) in 2004. Through the application of national road traffic forecasts, based on the central growth projections, traffic flows could increase to 5965 vpd in the 2009 Opening Year and 7193 vpd in the 2024 Design Year.

Examination of the results from the traffic model indicates that the journey time over this section of the A82 in 2009 would equate to 2.1 minutes. The proposed improvement option would decrease journey times to 0.9 minutes, which equates to a saving of 1.2 minutes or 57% in the 2009 year of opening.

There are no over-capacity links or over-capacity junctions on this section of the A82 in the do-minimum and the do-something networks.

The results from the traffic models indicate that the proposed improvement option would deliver the following savings in the numbers of Personal Injury Accidents (PIAs):

- PIA savings in the 2009 Year of Opening 0.5
- PIA savings in the 2024 Design Year 0.5
- PIA savings over 60-year scheme life 32.7

Economic Assessment

The results from the NESA model indicate that the proposed improvement option would generate a positive economic return.

The results obtained from the NESA model indicate that the total consumer and business user benefits associated with the improvement option equate to £2.15 based on the measured and the adjusted geometry respectively. Savings in road traffic accidents equate to benefits of £0.45m. This information is summarised in Table 5.7b.

Table 5.7b – NESA Appraisal Crianlarich

	44% OB Meas	**25% OB Meas**
Consumer User Benefits	1.12	1.12
Business Benefits	1.03	1.03
Private Sector Provider Impacts	0.00	0.00
Accident Benefits	0.45	0.45
Present Value of Benefits	**2.59**	**2.59**
Government Funding (Present Value of Costs)	**4.68**	**4.07**
Overall Impact		
Net Present Value	**-2.09**	**-1.48**
Benefit to Cost Ratio	**0.55**	**0.64**

Note: Costs in 2002 Prices in £m discounted to 2002 at 3.5% discount rate for 30-year evaluation thereafter 3.0% for 46 years thereafter 2.5%.

The results obtained from the QUADRO model to assess the cost of delays during construction and future maintenance works are summarised in Table 5.7c.

Table 5.7c – QUADRO Appraisal Crianlarich

	20% OB	**10% OB**
Present Value of Benefits During Construction	0.00	0.00
Present Value of Benefits During Future Maintenance	0.00	0.00
Present Value of Cost	-0.17	-0.17
Net Present Value	0.17	0.17

Note: Costs in £m in 2002 Prices discounted to 2002 at 3.5% discount rate for 30-year evaluation and 3.0% thereafter.

The results from the QUADRO model indicate that delays during construction would equate to £0.00m depending on the level of duration optimism bias, with a Net Present Value (NPV) of £0.17m for both 20% and 10% optimism bias.

The overall economic appraisal of the improvement option in market prices, based on the combined NESA and QUADRO appraisals and the application of NRTF (1997) central traffic growth projection, is shown in Table 5.7d.

Table 5.7d – Combined NESA/QUADRO Appraisal Crianlarich

	44% OB Meas.	**25% OB Meas.**
Present Value of Benefits (£m)	2.59	2.59
Present Value of Cost (£m)	4.51	3.89
Net Present Value (£m)	-1.92	-1.30
Benefit to Cost Ratio	0.57	0.67

Note: Costs in 2002 Prices in £m discounted to 2002

Based on the combined NESA and QUADRO results, the NPVs of the scheme would range from -£1.92m to -£1.30m, with corresponding BCRs ranging from 0.57 to 0.67.

Although the provision of a new roundabout, as included in the do-something model, would provide a reasonable junction between the A82 and A85, the road user costs associated with delays at the roundabout are significant. An initial examination of an alternative layout, based on the provision of a priority junction, with the A85 forming the minor arm, suggests that the benefits of the scheme would be more consistent with the scheme costs.

5.8 Loch Tulla

Description of Improvement Scheme

The improvement option involves the provision of a new off-line 2.0 kilometre long single 3-lane carriageway including a northbound climbing lane between two 0.5 kilometre long single 2-lane carriageways. The improvement, which extends from route chainage 49.5 kilometres to route chainage 53.6 kilometres, is based on a 10.0 metre wide carriageway (6.6m northbound and 3.4m southbound) with 1.0 metre wide hard strips and 2.5 metre wide verges, with an overall width of 17.0 metres.

The improvement consists of the following elements:

- A 0.26 kilometre generally off-line single 2-lane carriageway section extending from the A82 tie-in at route chainage 49.5 kilometres, which is 1.0 kilometre south of the HGV speed limit restriction section, to the new southern priority junction;
- A 0.24 kilometre off-line single 2-lane carriageway section extending from the new southern priority junction to the single 3-lane carriageway;
- A 2.00 kilometre off-line 3-lane single carriageway including a northbound climbing lane;
- A 0.32 kilometre off-line single 2-lane carriageway section extending from the single 3-lane carriageway to the new northern priority junction;
- A 0.18 kilometre generally off-line single 2-lane carriageway section extending from the new northern priority junction to tie into the existing A82 at route chainage 53.6 kilometres, which is approximately 0.8 kilometres north of the existing HGV speed limit section; and
- Realignment of the existing A82 to the two new priority junctions.

The general location of the improvement option is shown in Figure 5.5.

Scheme Cost Estimate

The indicative cost estimates that were used as the basis of the economic appraisal of the improvement option, based on mid-2005 prices and excluding VAT, are summarised below:

- Excluding Optimism Bias £10.0m (approx. £3.3m / km)
- Including 44% Optimism Bias £14.3m (approx. £4.8m / km)
- Including 25% Optimism Bias £12.5m (approx. £4.2m / km)

For the purpose of the economic appraisal only, it has been assumed that 47%, 50% of the costs would be spent in the years 2008 an 2009 respectively, with a final 3% in the 2010 year of opening.

Engineering Assessment

The construction of a climbing lane over this section of the A82 should not present a major challenge, although the climbing lane would on a steep gradient and further investigations of the local topography and local ground conditions will be required to support an engineering assessment of the improvement option.

The provision of the existing routes should help to minimise the delays to road users.

A more detailed assessment of engineering conditions will be required as the improvement option is developed, with a full assessment in accordance with DMRB being undertaken thereafter.

Environmental Assessment

The most significant impact with the greatest consequence is the potential effect on the integrity of the Rannoch Moor SAC. Any impact on the integrity of the SAC is considered to be significant and therefore careful consideration given in development of the strategy for this part of the route. Equally the same logic is applied where there are potential impacts on scheduled protected species.

Key environmental issues:

- Impacts on watercourses.
- Potential impacts on water vole and otter if present along watercourses.
- Potential impacts on freshwater pearl mussel if present in Water of Tulla.
- Potential major landscape and visual effects by creating an additional prominent route.

An overall appraisal summary of the Loch Tulla improvement option is shown in Table 5.8a.

Table 5.8a - Overall appraisal summary

Sector	Assessment	Appraisal of Impact
Noise, vibration and air quality:	Positive moderate impact	Minor
Water quality	Potentially moderate adverse impact	Minor
Ecology	Potentially moderate adverse impact	Minor
Landscape and Visual	Significant adverse impact	Major
Cultural Heritage	Neutral impact	Neutral

Operational Assessment

The information from the traffic model indicates that the 2-way 24-hour Annual Average Daily Traffic Flow on this section of the A82 is 3107 vehicles per day (vpd) in 2004. Through the application of national road traffic forecasts, based on the

central growth projections, traffic flows could increase to 3409 vpd in the 2010 Opening Year and 4070 vpd in the 2025 Design Year.

Examination of the results from the traffic model indicates that the journey time over this section of the A82 in 2010 would equate to 3.83 minutes. The proposed improvement option would decrease journey times to 2.11 minutes, which equates to a saving of 1.72 minutes or 45% in the 2010 year of opening.

There are no over-capacity links or over-capacity junctions on this section of the A82 in the do-minimum and the do-something networks.

The results from the traffic models indicate that the proposed improvement option would deliver the following savings in the numbers of Personal Injury Accidents (PIAs):

- PIA savings in the 2010 Year of Opening 0.8
- PIA savings in the 2025 Design Year 0.8
- PIA savings over 60-year scheme life 45.5

Economic Assessment

The results from the NESA model indicate that the proposed improvement option would generate a positive economic return.

The results obtained from the NESA model indicate that the total consumer and business user benefits associated with the improvement option equate to £12.45 based on the measured and the adjusted geometry respectively. Savings in road traffic accidents equate to benefits of £3.20m. This information is summarised in Table 5.8b.

Table 5.8b – NESA Appraisal Loch Tulla

	44% OB Meas	**25% OB Meas**
Consumer User Benefits	6.49	6.49
Business Benefits	5.96	5.96
Private Sector Provider Impacts	0.33	0.33
Accident Benefits	3.20	3.20
Present Value of Benefits	**15.98**	**15.98**
Government Funding (Present Value of Costs)	**16.68**	**14.71**
Overall Impact		
Net Present Value	**-0.70**	**1.27**
Benefit to Cost Ratio	**0.96**	**1.09**

Note: Costs in 2002 Prices in £m discounted to 2002 at 3.5% discount rate for 30-year evaluation thereafter 3.0% for 46 years thereafter 2.5%.

The results obtained from the QUADRO model to assess the cost of delays during construction and future maintenance works are summarised in Table 5.8c.

Table 5.8c – QUADRO Appraisal Loch Tulla

	20% OB	**10% OB**
Present Value of Benefits During Construction	0.00	0.00
Present Value of Benefits During Future Maintenance	0.02	0.02
Present Value of Cost	-0.67	-0.67
Net Present Value	0.69	0.69

Note: Costs in £m in 2002 Prices discounted to 2002 at 3.5% discount rate for 30-year evaluation and 3.0% thereafter.

The results from the QUADRO model indicate that delays during construction would equate to £0.00m depending on the level of duration optimism bias, with a Net Present Value (NPV) of £0.69m for both 20% and 10% optimism bias.

The overall economic appraisal of the improvement option in market prices, based on the combined NESA and QUADRO appraisals and the application of NRTF (1997) central traffic growth projection, is shown in Table 5.8d.

Table 5.8d – Combined NESA/QUADRO Appraisal Loch Tulla

	44% OB Meas.	**25% OB Meas.**
Present Value of Benefits (£m)	16.00	16.00
Present Value of Cost (£m)	16.01	14.04
Net Present Value (£m)	-0.01	1.96
Benefit to Cost Ratio	1.00	1.14

Note: Costs in 2002 Prices in £m discounted to 2002

Based on the combined NESA and QUADRO results, the NPVs of the scheme would range from -£0.01m to £1.96m, with corresponding BCRs ranging from 1.00 to 1.14.

5.9 Corran Ferry to Fort William

Description of Improvement Scheme

The improvement option involves the provision of a new generally on-line 4.00 kilometre long single 2-lane carriageway extending from route chainage 98.3 kilometres to the bridge at route chainage 102.3 kilometres. The improvement is based on a 7.3 metre wide carriageway with 1.0 metre wide hard strips and 2.5 metre wide verges, with an overall width of 14.3 metres.

The location and nature of the improvement option for the Corran Ferry to Fort William section of the A82 will require a more detailed examination of local conditions, however the above option provides an indication of the level of benefit that can be expected for an improvement on this section of the A82.

Scheme Cost Estimate

The indicative cost estimates that were used as the basis of the economic appraisal of the improvement option, based on mid-2005 prices and excluding VAT, are summarised below:

- Excluding Optimism Bias £8.5m (approx. £2.1m / km)
- Including 44% Optimism Bias £12.2m (approx. £3.1m / km)
- Including 25% Optimism Bias £10.6m (approx. £2.7m / km)

For the purpose of the economic appraisal only, it has been assumed that 47%, 50% of the costs would be spent in the years 2008 an 2009 respectively, with a final 3% in the 2010 year of opening.

The general location of the improvement option is shown in Figure 5.6.

Engineering Assessment

Route options are based on relatively small scale mapping and a further engineering assessment based on more detailed topographical survey will be required to confirm the feasibility of providing full standard carriageway on this section.

Due to the constrained alignment of the A82 over this length, there may be the requirement for extensive lengths of rock cut or retaining walls. Construction of this length of improved carriageway will present significant challenges, involving difficult topography within tight constraints.

The lack of local diversion routes along Loch Linnhe is likely to present considerable traffic management challenges that will inevitably result in significant delays to road users and disruption to the local community.

A more detailed assessment of engineering conditions will be required as the improvement option is developed, with a full assessment in accordance with DMRB being undertaken thereafter.

Environmental Assessment

Overall the focus of impacts centre around protected species and their habitats and the protection of waterbodies such as the River Kiachnish and Loch Linnhe. Impacts on the landscape and visual impacts is assessed as being of a lesser extent and focused upon the loss of existing semi-natural broad leaved woodland. Any impact on the integrity of either an individual species or its habitat is considered to be significant.

Key environmental issues:

- Direct loss of ancient woodland habitat.
- Impacts on watercourses.
- Potential impacts on bats, red squirrel, wild cat and pine marten if present
- Potential impacts on water vole if present along watercourses.
- Potential impacts on otter if present along watercourses and shoreline of Loch Linnhe.
- Potential impacts on herptiles (Slow worm, Common Lizard and Adder if present.
- Potential landscape and visual effects resulting from loss of woodland, encroachment into the shore line and uniformity of design

An overall appraisal summary of the Corran Ferry to Fort William improvement option is shown in Table 5.9a.

Table 5.9a - Overall appraisal summary

Sector	Assessment	Appraisal of Impact
Noise, vibration and air quality	Neutral impact	Neutral
Water quality	Potentially moderate adverse impact	Minor
Ecology	Potentially moderate adverse impact	Minor
Geology, landuse, agriculture and soils	Potentially moderate adverse impact	Minor
Landscape and Visual	Moderate adverse impact	Minor
Cultural Heritage	Neutral Impact	Neutral

Operational Assessment

The information from the traffic model indicates that the 2-way 24-hour Annual Average Daily Traffic Flow on this section of the A82 is 5999 vehicles per day (vpd) in 2004. Through the application of national road traffic forecasts, based on the central growth projections, traffic flows could increase to 6588 vpd in the 2010 Opening Year and 7892 vpd in the 2025 Design Year.
Examination of the results from the traffic model indicates that the journey time over this section of the A82 in 2010 would equate to 12.81 minutes. The proposed improvement option would decrease journey times to 12.13 minutes, which equates to a saving of 0.68 minutes or 5% in the 2010 year of opening.

There are no over-capacity links or over-capacity junctions on this section of the A82 in the do-minimum and the do-something networks.

The results from the traffic models indicate that the proposed improvement option would deliver the following savings in the numbers of Personal Injury Accidents (PIAs):

- PIA savings in the 2010 Year of Opening 1.0
- PIA savings in the 2025 Design Year 1.7
- PIA savings over 60-year scheme life 103.6

Economic Assessment

The results from the NESA model indicate that the proposed improvement option would generate a positive economic return.

During the calibration of the do-minimum model, it was noted that the speeds derived from the journey time surveys were slower than the modelled speeds based on the measured geometry of the route. An adjustment factor was therefore applied to the measured geometry to improve the calibration of the do-minimum network modelled speeds. The economic assessment of the improvement option is therefore based on the measured geometry of the do-something network against the calibrated do-minimum network. To maintain consistency between the do-minimum and the do-something networks, a second do-something network was created whereby the measured geometry for the do-something network was also adjusted by the same factor. The results from both assessments are presented in this report.

The results obtained from the NESA model indicate that the total consumer and business user benefits associated with the improvement option equate to £13.08 and £12.88m based on the measured and the adjusted geometry respectively. Savings in road traffic accidents equate to benefits of £3.01m. This information is summarised in Table 5.9b.

Table 5.9b – NESA Appraisal Corran Ferry to Fort William

	44% OB Meas	44% OB Adj	25% OB Meas	25% OB Adj
Consumer User Benefits	6.74	6.64	6.74	6.64
Business Benefits	6.34	6.24	6.34	6.24
Private Sector Provider Impacts	-0.01	-0.01	-0.01	-0.01
Accident Benefits	3.01	3.01	3.01	3.01
Present Value of Benefits	**16.08**	**15.88**	**16.08**	**15.88**
Government Funding (Present Value of Costs)	**12.00**	**12.03**	**10.32**	**10.35**
Overall Impact				
Net Present Value	**4.08**	**3.85**	**5.76**	**5.53**
Benefit to Cost Ratio	**1.34**	**1.32**	**1.56**	**1.53**

Note: Costs in 2002 Prices in £m discounted to 2002 at 3.5% discount rate for 30-year evaluation thereafter 3.0% for 46 years thereafter 2.5%.

The results obtained from the QUADRO model to assess the cost of delays during construction and future maintenance works are summarised in Table 5.9c.

Table 5.9c – QUADRO Appraisal Corran Ferry to Fort William

	20% OB	10% OB
Present Value of Benefits During Construction	-0.56	-0.51
Present Value of Benefits During Future Maintenance	0.03	0.03
Present Value of Cost	-0.73	-0.73
Net Present Value	0.21	0.25

Note: Costs in £m in 2002 Prices discounted to 2002 at 3.5% discount rate for 30-year evaluation and 3.0% thereafter.

The results from the QUADRO model indicate that delays during construction would equate to between £0.56m and £0.51m depending on the level of duration optimism bias, with Net Present Values (NPVs) of between £0.21m and £0.25m for 20% and 10% optimism bias respectively.

The overall economic appraisal of the improvement option in market prices, based on the combined NESA and QUADRO appraisals and the application of NRTF (1997) central traffic growth projection, is shown in Table 5.9d.

Table 5.9d – Combined NESA/QUADRO Appraisal Corran Ferry to Fort William

	44% OB Meas.	44% OB Adj.	25% OB Meas.	25% OB Adj.
Present Value of Benefits (£m)	15.55	15.35	15.60	15.40
Present Value of Cost (£m)	11.27	11.30	9.59	9.62
Net Present Value (£m)	4.29	4.06	6.01	5.78
Benefit to Cost Ratio	1.38	1.36	1.63	1.60

Note: Costs in 2002 Prices in £m discounted to 2002

Based on the combined NESA and QUADRO results, the NPVs of the scheme would range from £4.06m to £6.01m, with corresponding BCRs ranging from 1.36 to 1.63.

Given that the improvement option was limited to the widening of the road to create a standard 7.3m wide carriageway over a 4km length, the economic returns are reasonable and suggest that further improvements to this section may be possible.

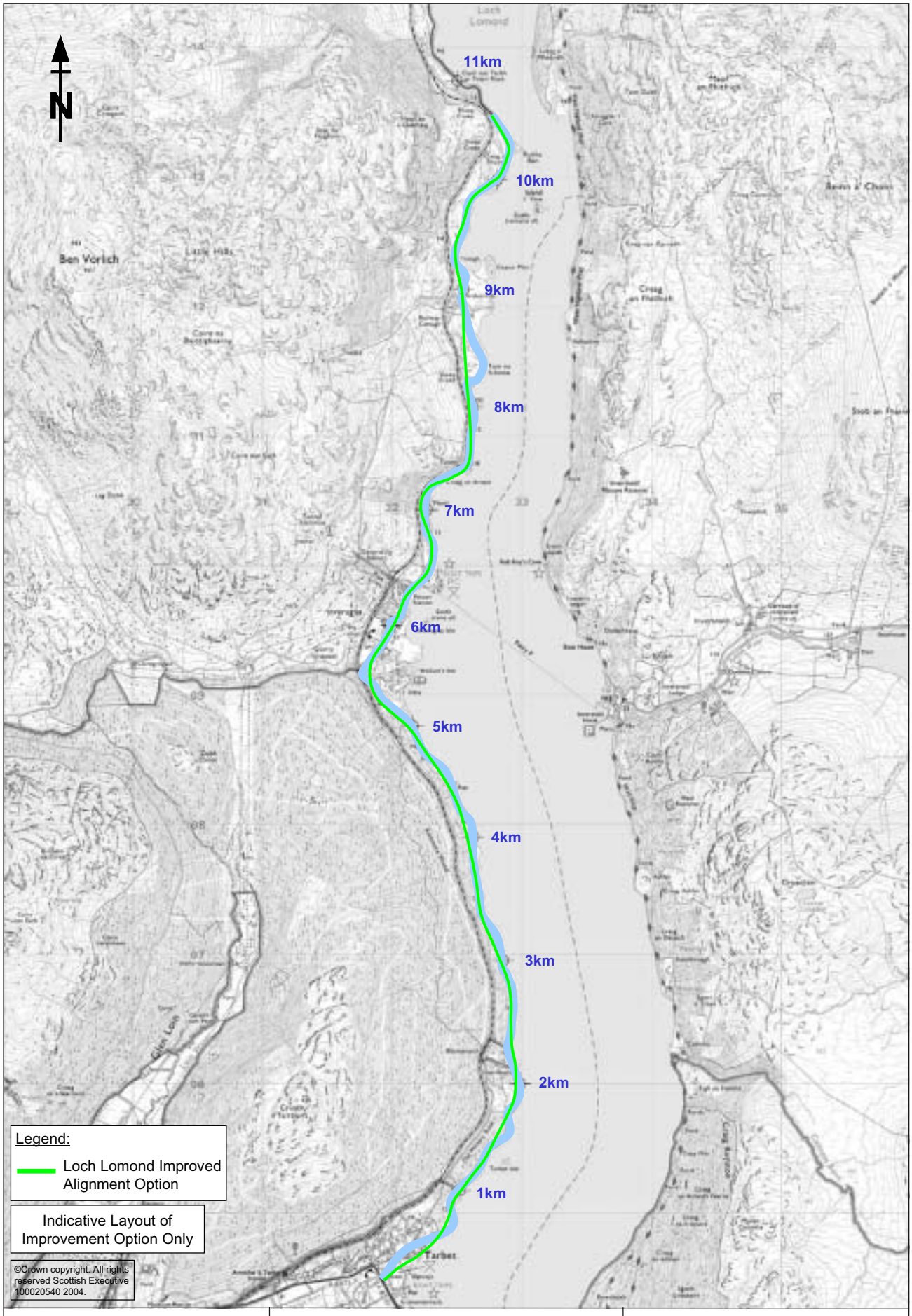

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Figure 5.1
General Location of Improvement Option
Tarbet to South of Pulpit Rock

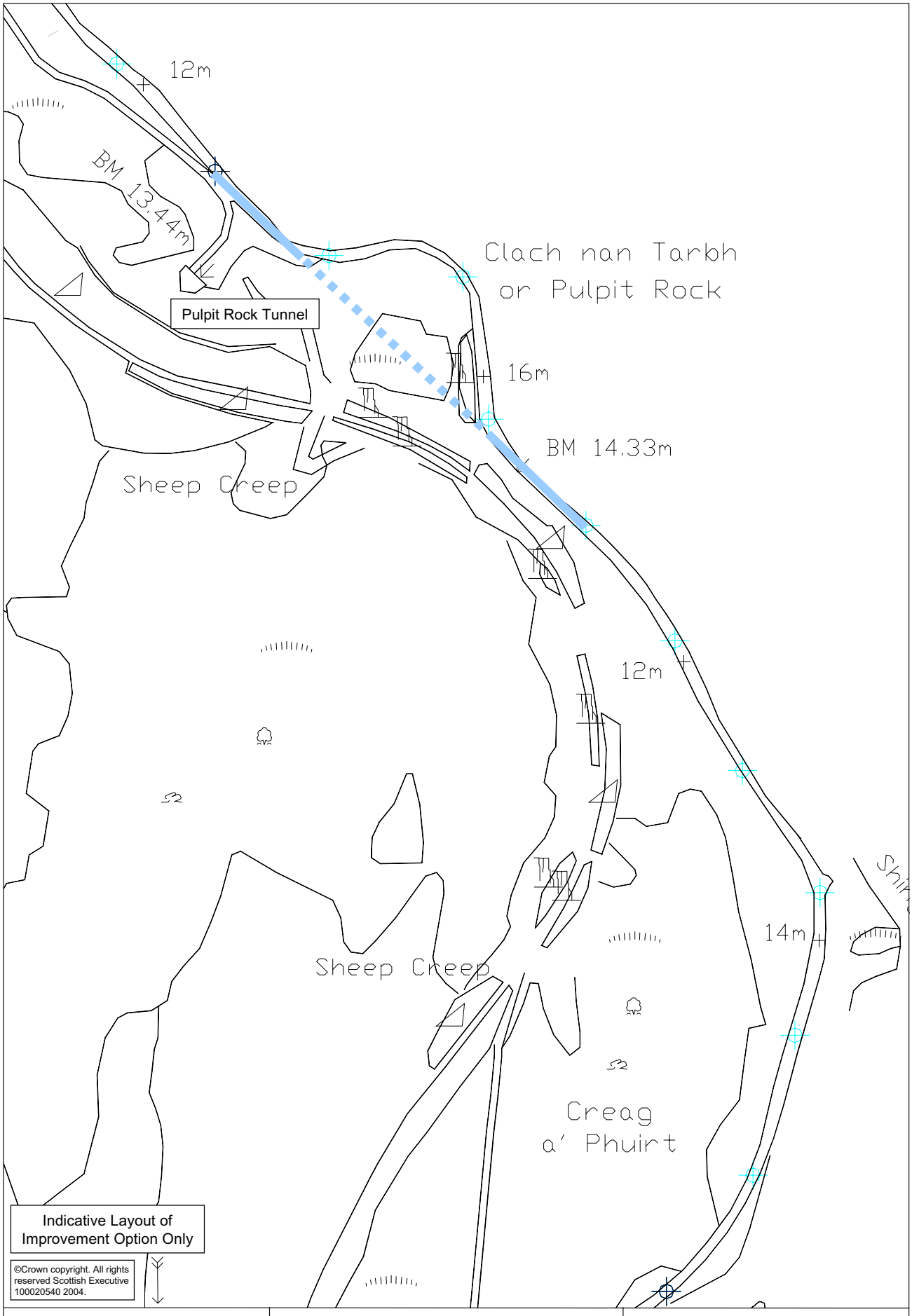

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Figure 5.2
General Location of Improvement Option
Pulpit Rock

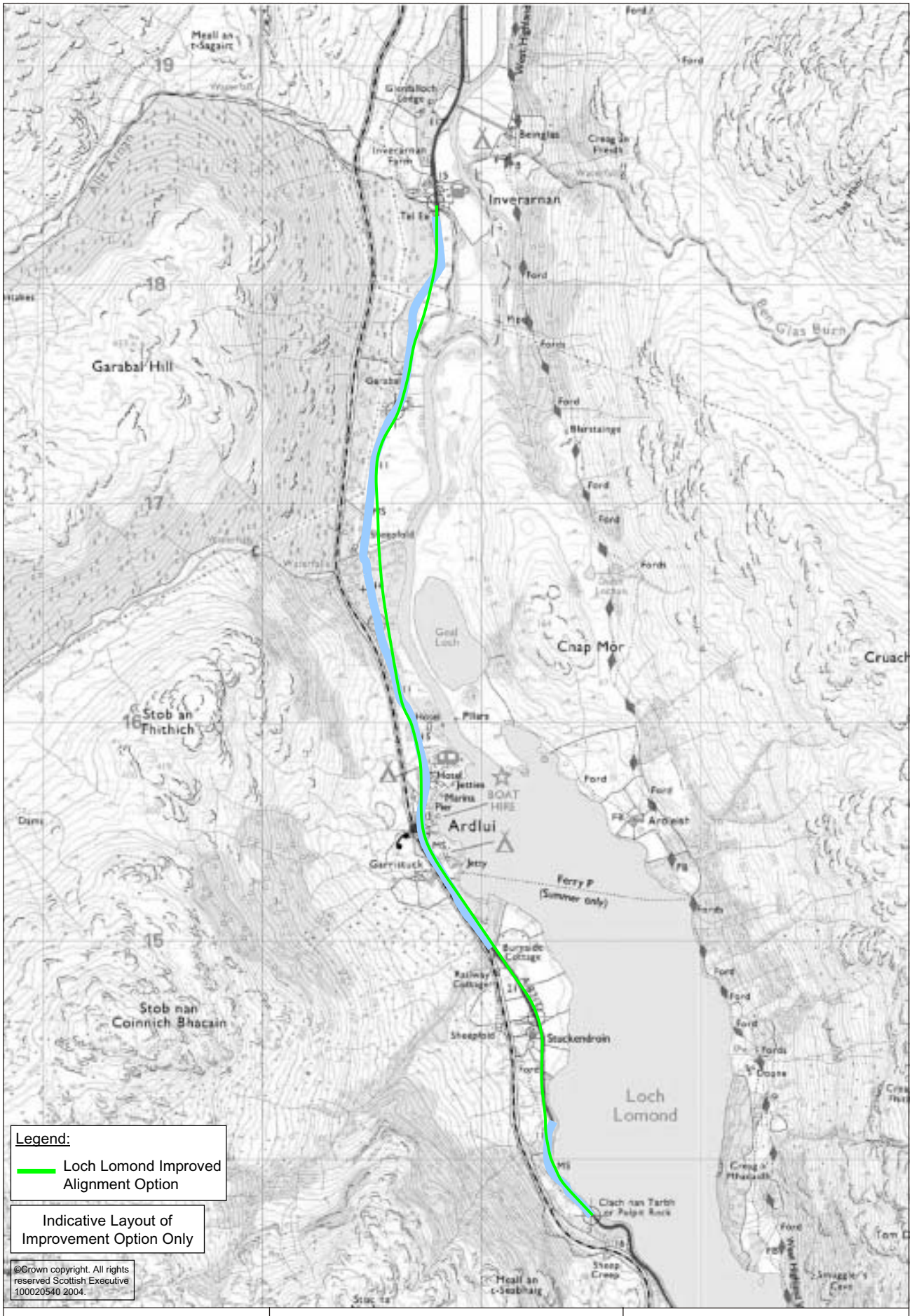

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Figure 5.3
General Location of Improvement Option North of Pulpit to Inverarnan

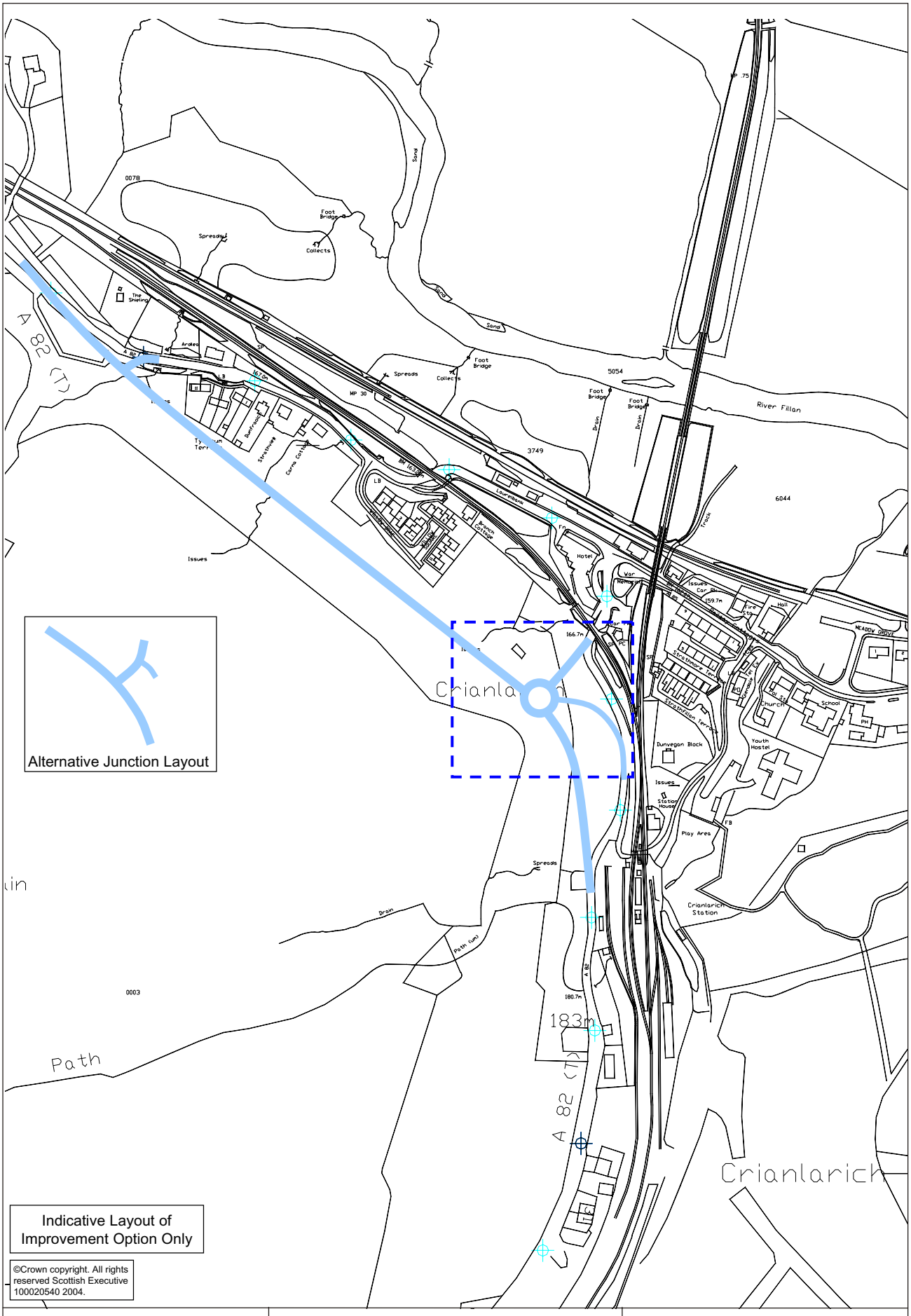

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Figure 5.4
General Location of Improvement Option
Crianlarich Bypass

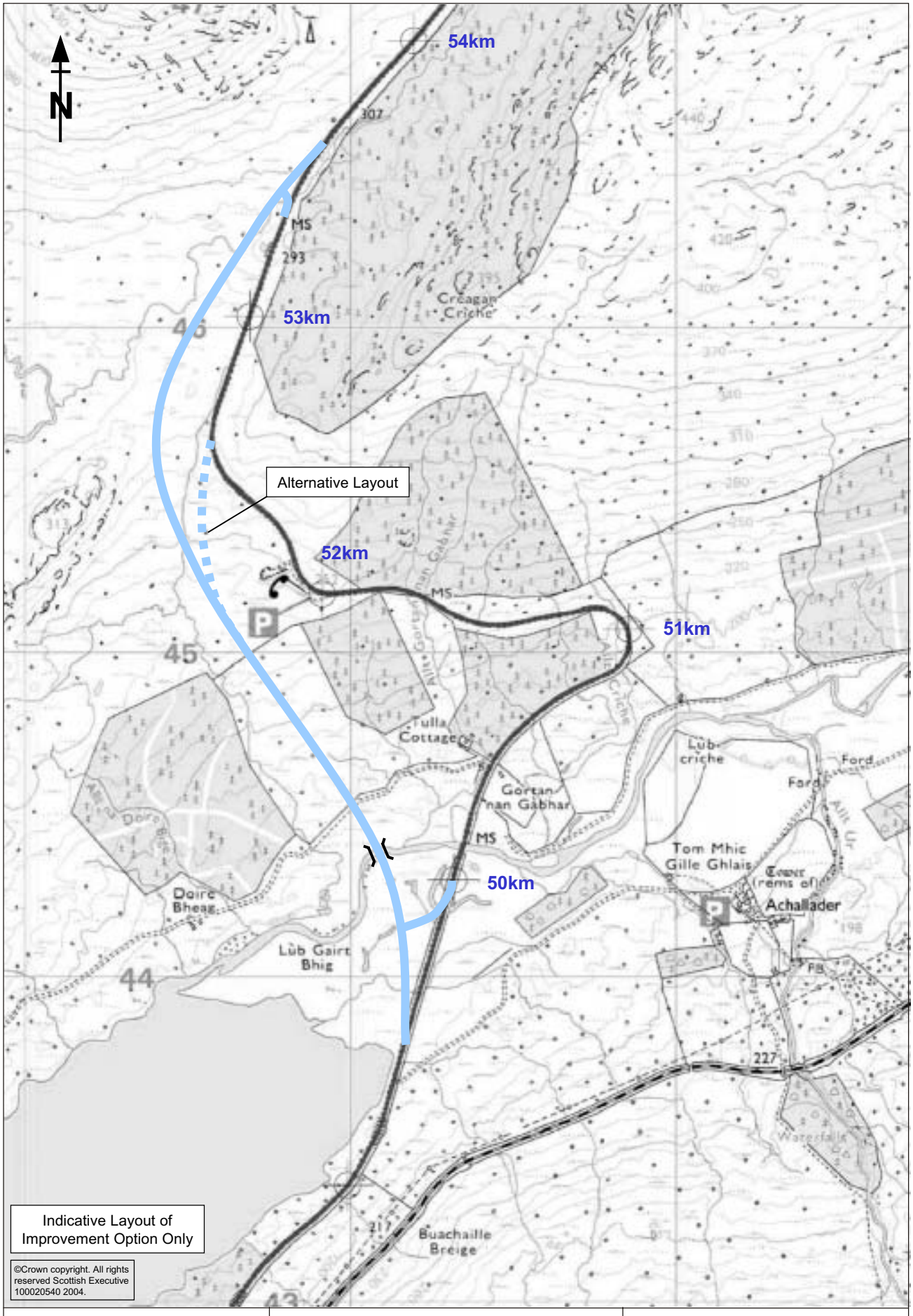

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Figure 5.5
General Location of Improvement Option
Loch Tulla

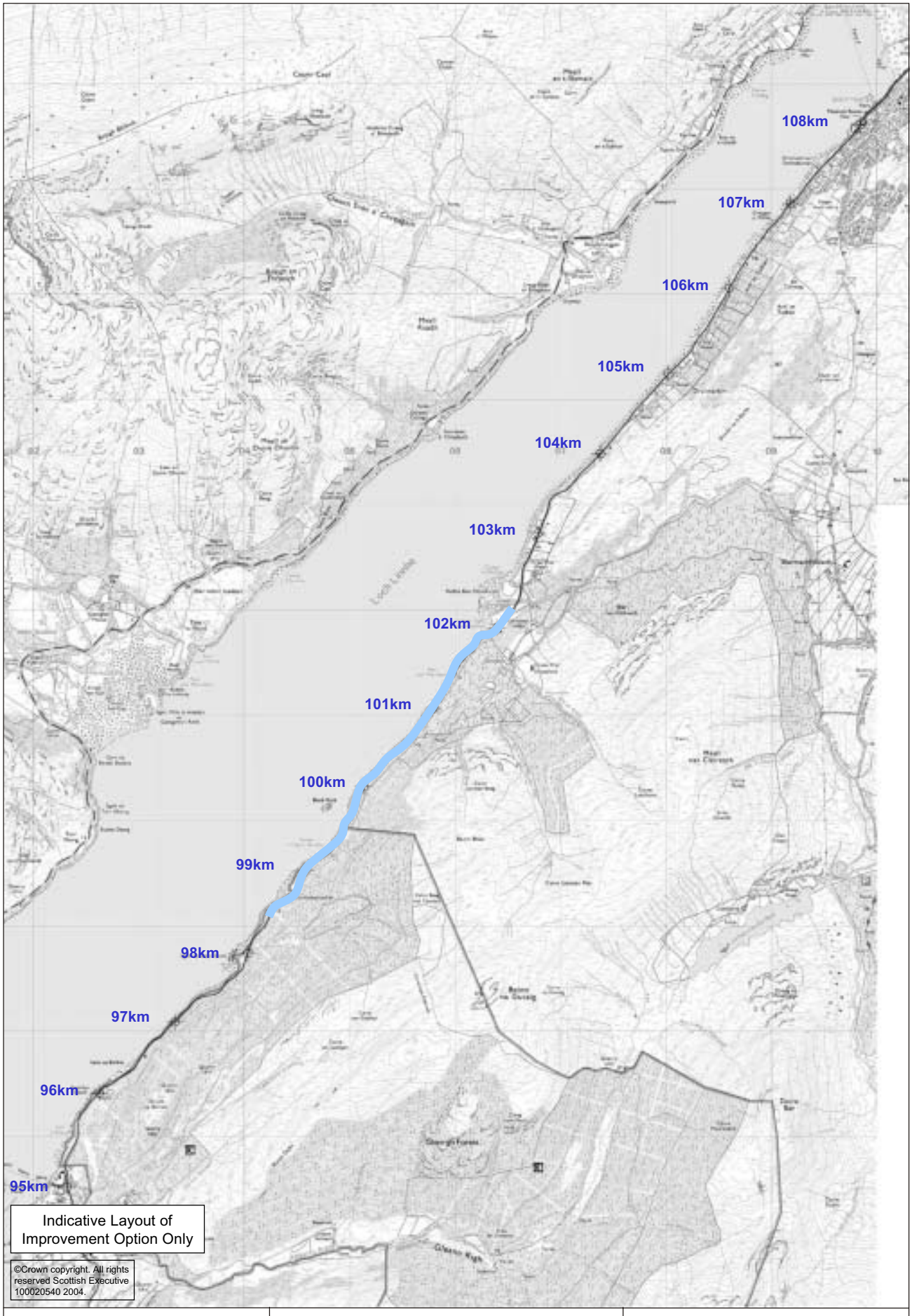

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Figure 5.6
General Location of Improvement Option
Fort William

6. ROAD SAFETY IMPROVEMENTS

6.1 Introduction

As part of the Route Action Plan, an analysis of recent road traffic accident trends and characteristics was undertaken. This analysis led to the identification of accident clusters and the consideration of accident remedial measures. In total, some 14 accident clusters were identified along the A82 between Tarbet and Fort William, details of which are shown below and in Figures 6.1a to 6.1f.

The improvement options at these locations should be investigated further and developed in consultation with the various AIP teams to improve road safety conditions along the route.

6.2 Identification of Accident Clusters

Accident Location 1 – A82/A83 Junction, Tarbet

A total of 5 accidents occurred at this location, including 3 slight and 1 serious accident at the A82/A83 junction. The provision of additional signage advising drivers of queuing vehicles may assist reducing rear collisions at or on the approach to the junction.

Accident Location 2 – Chainage 4-5km, Kenmore Wood

A total of 6 accidents, including 2 slight, 3 serious and 1 **fatal** accident, occurred at this location some 1.5km south of Inveruglas with drivers losing control possibly due to vehicle speeds given the poor sight distances and horizontal geometry. Improving sight distances and local widening of the carriageway may help to reduce collisions between vehicles on the bends.

Accident Location 3 – Chainage 9km, Ardvorlich

A total of 5 accidents occurred at this location, including 4 serious and 1 slight accident. None of these accidents appear to be junction related, with 3 of the 5 accidents being caused by drivers losing control on a left hand bend. Four of the 5 accidents on this section involved motorcycles. Improved warning signs and the provision of anti-skid surfacing may help to reduce accidents on this section.

Accident Location 4 – Chainage 13km, Ardlui

A total of 4 accidents occurred at this location, including 3 slight and 1 serious accident. Two of the 4 accidents involved collisions with oncoming vehicles, with 1 accident involving a car and a bus, the other involving 2 minibuses. The other 2 accidents involved motorcycles. Local carriageway widening with hatched ladder markings or similar measures warning of oncoming vehicles and prohibiting overtaking would reduce the risk of head-on or side-on collisions.

Accident Location 5 – Chainage 16-17km, North of Inverarnan

A total of 3 accidents occurred at this location, including 2 serious and 1 slight accident. All accidents involved a single car losing control in wet weather. Improved surface drainage could assist in reducing the amount of standing water collecting on the road surface and additional warning signs could be introduced to advise drivers of the potential hazards.

Accident Location 6 – Crianlarich

A total of 6 accidents occurred at this location, including 5 slight and 1 serious, which occurred around the railway bridge to the north of Crianlarich. Three accidents involved a collision with an oncoming vehicle at the railway bridge, and 2 involved either a side-on collision or rear impact. The provision of additional signs to advise drivers of the potential hazard could improve road safety. The effects of a local bypass are also considered in this report.

Accident Location 7 – Chainage 33km, South of Tyndrum

A total of 5 accidents occurred at this location, including 1 **fatal**, 2 serious and 2 slight accidents. Two accidents involved collisions between oncoming vehicles, both of which occurred in wet weather conditions, and 2 accidents involved southbound drivers losing control on a bend. As the accidents occurred in wet weather conditions, improved surface drainage and additional road signs advising drivers of the hazards and the bends could improve road safety at this location.

Accident Location 8 – Chainage 64km, North of junction to Glencoe Ski Centre

Three accidents occurred at this location, including 1 **fatal**, 1 serious and 1 slight accident, involving either collisions with an oncoming vehicle during overtaking manoeuvres, or drivers losing control on the bends. As there is a long, straight section of road approaching this location, additional road signs to encourage drivers to reduce their speed could improve road safety at this location.

Accident Location 9 – Chainage 83-84km, Glencoe Village

A total of 9 accidents occurred at this location, including 8 slight and 1 serious accident, the majority of which were junction related. An AIP scheme was implemented at this location in 1991/1992, which involved hatched ladder markings and signing at the B863 Glencoe, Kinlochleven junction at a cost of £5,000. Additional warning signs and anti-skid surfacing could be introduced at the junction to reduce the risk of drivers losing control.

Accident Location 10 – Chainage 89-90km, North Ballachulish

A total of 5 accidents occurred at this location, including 3 serious and 2 slight accidents. Two of the accidents involved collisions between vehicles, with drivers losing control on the bend. Anti-skid surfacing could be introduced at this location along with additional warning signs to reduce the risk of drivers losing control.

Accident Location 11 – Chainage 94-95km, Corran Ferry

A total of 5 accidents occurred at this location, including 4 slight and 1 serious accident, involving head-on collisions, drivers losing control, and rear, side and multiple collisions of vehicles, in some instances during wet weather conditions. An AIP scheme was implemented at this location in 1990/1991 from Cuilcheanna House to the Corran Ferry junction involving the installation of signing and bollards. Anti-skid surfacing, improved surface drainage and additional road signs to advise drivers of the potential hazards could be introduced to improve conditions in wet weather.

Accident Location 12 – Chainage 99km, Corrychurrachan

A total of 7 accidents occurred at this location, including 2 **fatal**, 2 serious and 3 slight accidents, of which 5 accidents involved drivers losing control and 4 accidents occurred in wet weather conditions. As 4 of the 5 accidents involved drivers losing control in wet weather conditions, improved drainage, anti-skid surfacing and additional signage could be introduced to improve road safety.

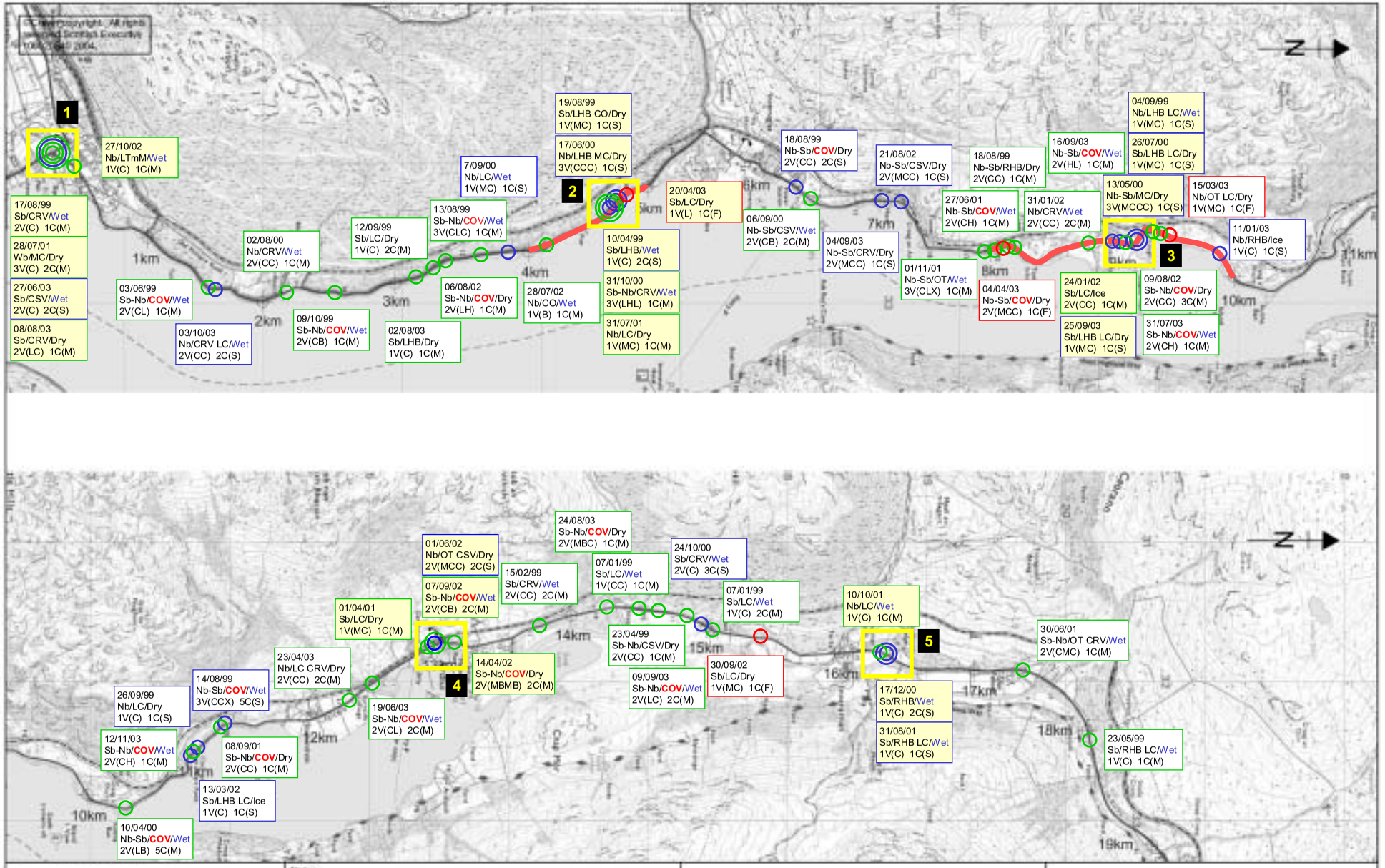
Accident Location 13 – Chainage 101-102km, Coruanan

A total of 4 accidents occurred at this location, including 2 serious and 2 slight, with the 2 serious accidents involving collisions with oncoming vehicles whilst negotiating a bend in the road. Additional signing and local carriageway widening may improve road safety, however, ladder markings are already present on this section of the A82.

Accident Location 14 – Chainage 107-108km, South of Fort William

A total of 4 slight accidents occurred at this location, 2 of which were junction related. Two of the accidents involved pedestrians being struck by vehicles, and 2 accidents involved drivers losing control in wet weather. An AIP scheme was implemented at this location in 1990/1991, where revised hatching and coloured surfacing with SLOW markings were installed to the south of Fort William at a cost of £3,500. Additional warning signs could be introduced to make drivers more aware of pedestrian movements in this area, with the introduction of safer crossings for pedestrians and anti-skid surfacing to reduce the risk of drivers losing control.

Based on the above, some 14 accident clusters on the A82 have been identified where the provision of localised low cost, say up to £25,000, measures such as additional signing, improved road markings, anti-skid surfacing, hatched ladder markings and junction bollards and more significant improvements such as better drainage and localised junction realignments would contribute positively to road safety. These initial options should be investigated further and developed in consultation with the various AIP teams to improve road safety conditions along the route.



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Notes:
Scale at A3 1:25,000

More than 5 accidents/km in 5 years (1999-2003)

Accident cluster

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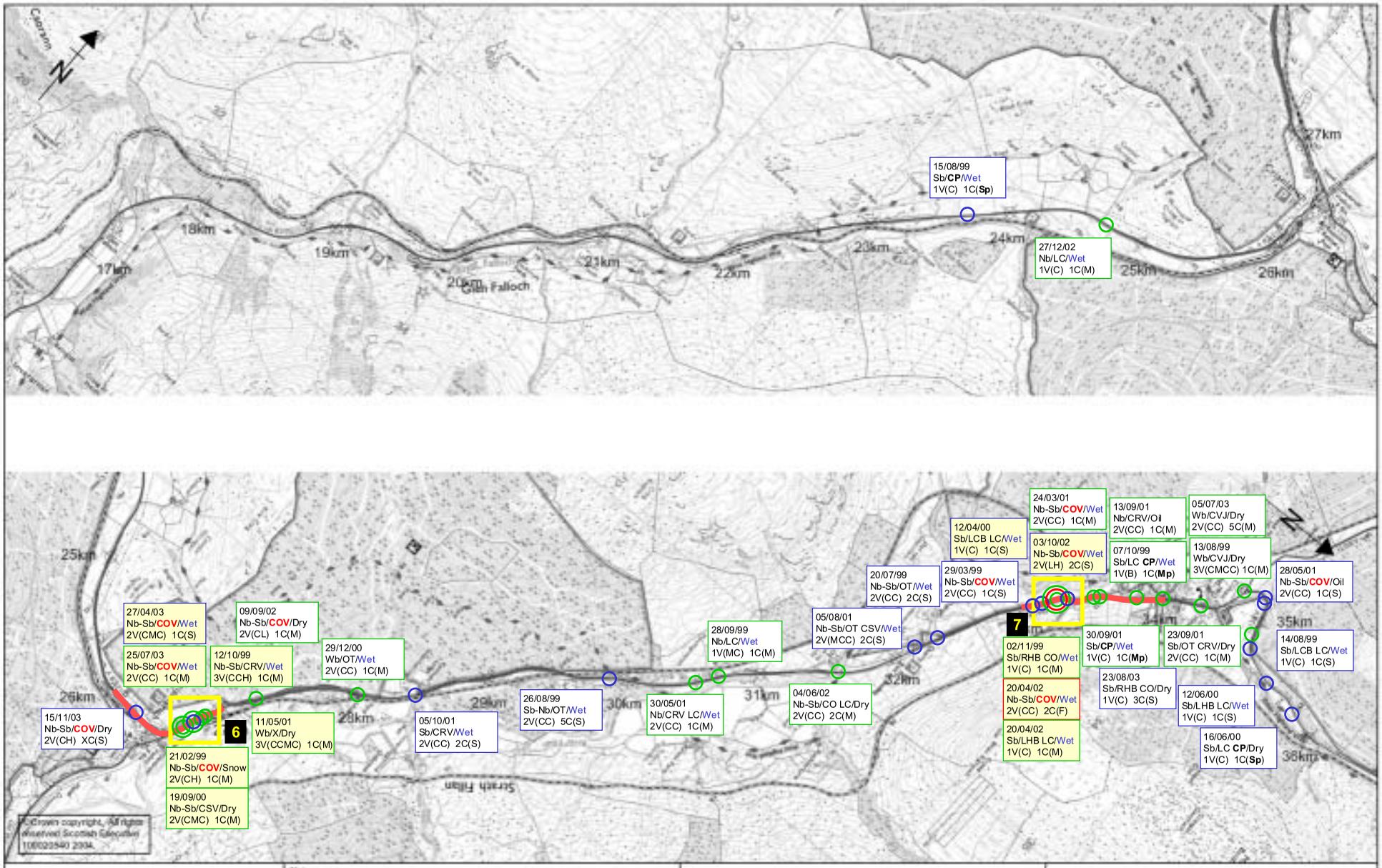
Figure 6.1a
A82 Accident Analysis
1999-2003



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More than 5 accidents/km in 5 years (1999-2003)

Accident cluster

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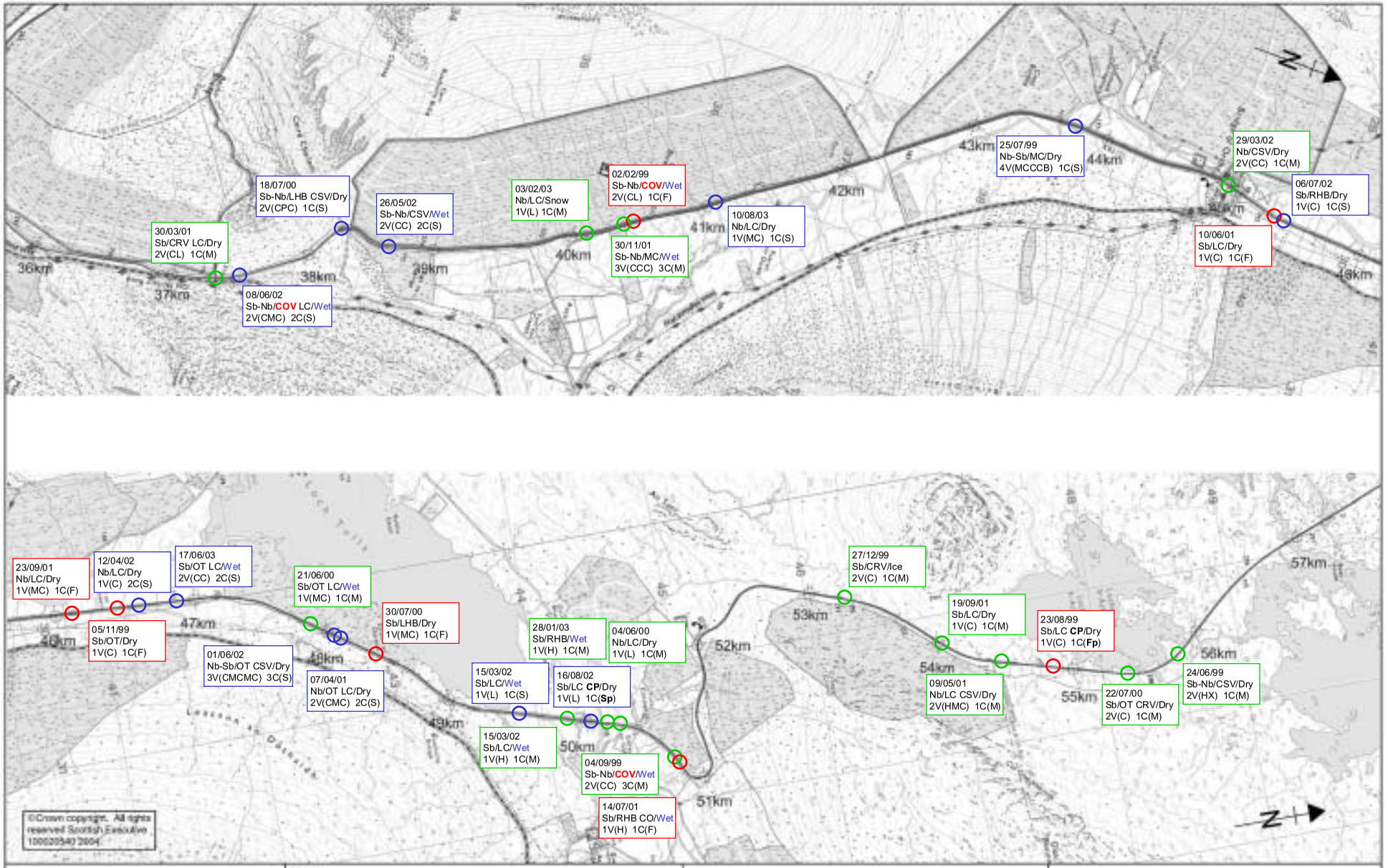
Figure 6.1b
A82 Accident Analysis
1999-2003



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Accident cluster

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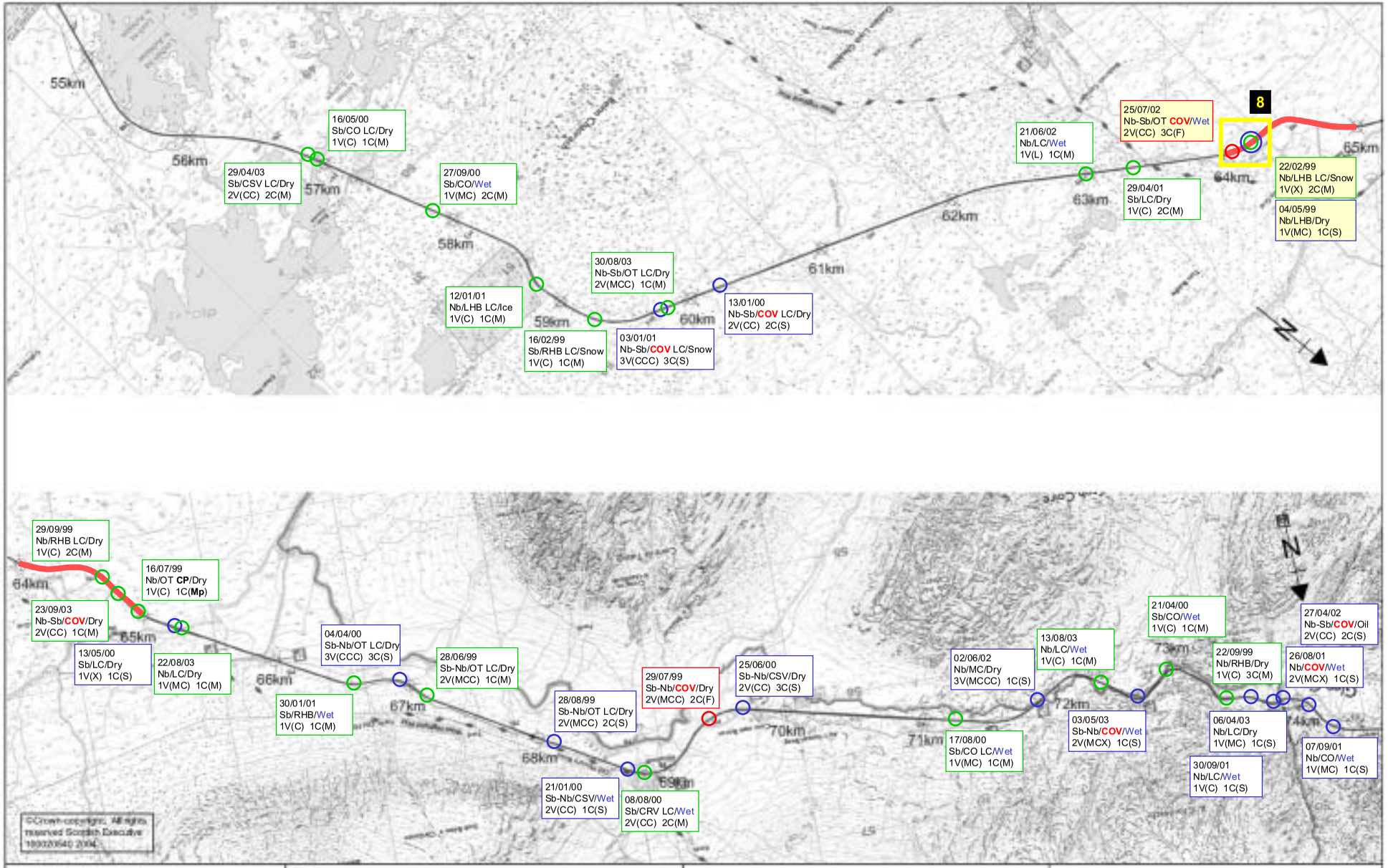
Figure 6.1c
A82 Accident Analysis
1999-2003



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More than 5 accidents/km in 5 years (1999-2003)

Accident cluster

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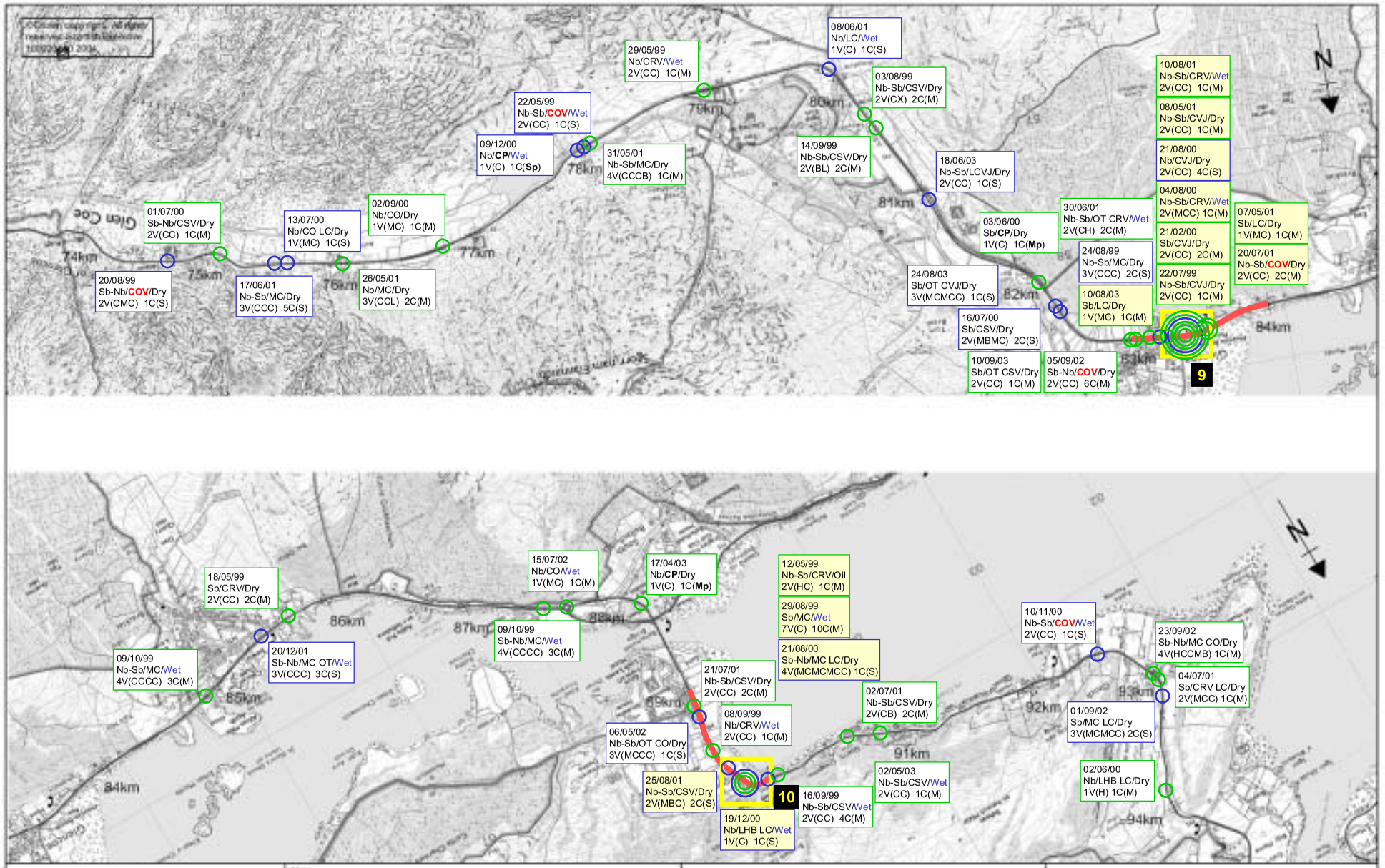
Figure 6.1d
A82 Accident Analysis
1999-2003



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Notes:
Scale on A3 1:25,000

More than 5 accidents/km in 5 years (1999-2003)

Accident cluster

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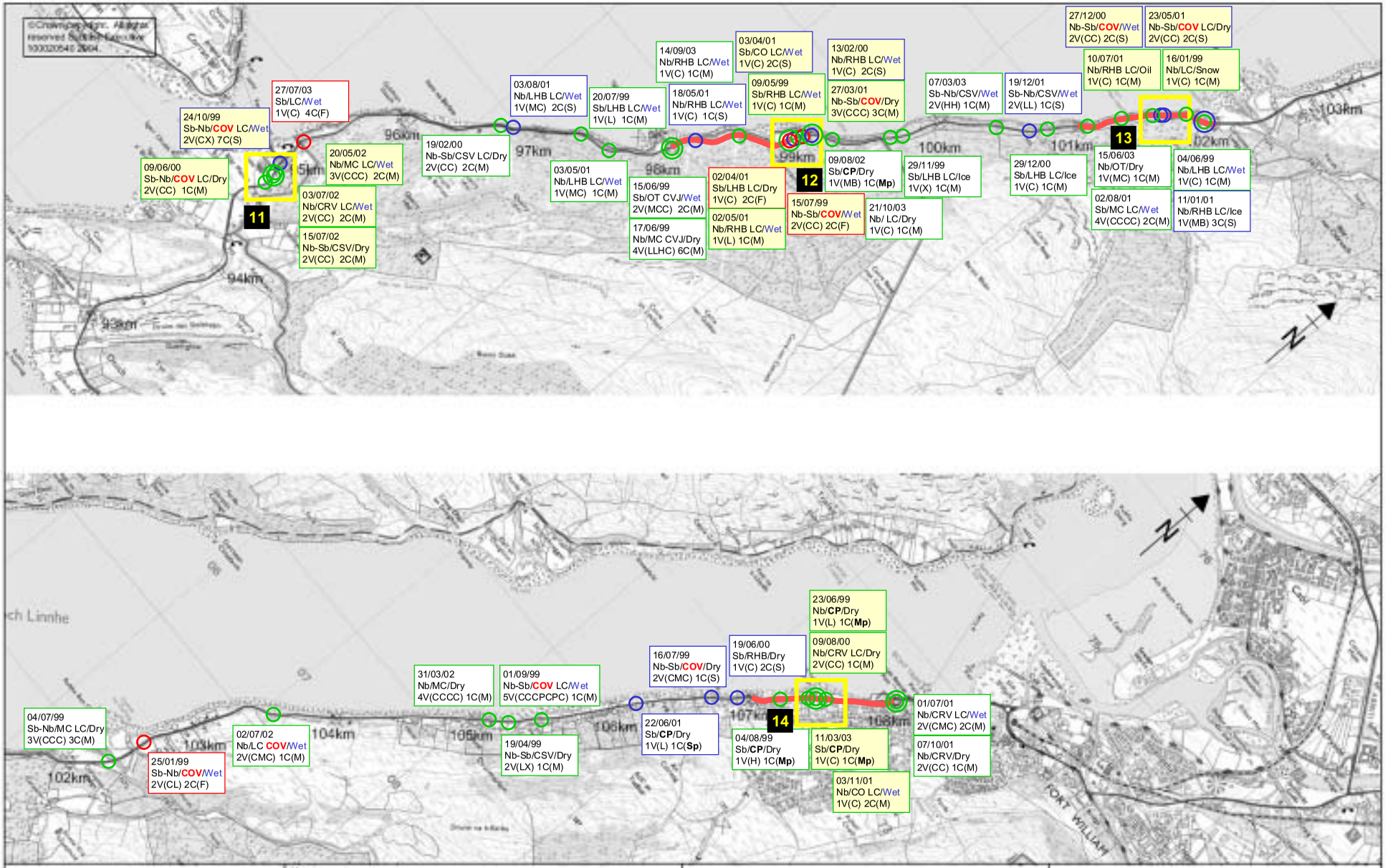
Figure 6.1e
A82 Accident Analysis
1999-2003



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Notes:
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More than 5 accidents/km in 5 years (1999-2003)

Accident cluster

A82 Tarbet to Fort William
Route Action Plan Study
Firm Strategy Report

Figure 6.1f
A82 Accident Analysis
1999-2003

7. LOCALISED CARRIAGEWAY WIDTH RESTRICTIONS

7.1 Introduction

Examination of the existing A82 confirms that some sections of the road are relatively narrow, particularly on the southern section between Tarbet and Pulpit Rock. In addition, a number of localised 'pinch points' have been identified, typically at bridges, where the width of the carriageway reduces significantly.

Over the length of the route, some 25 locations have been identified where the width of the carriageway reduces significantly. These sections are mainly located between Tarbet and Inverarnan and through Rannoch Moor and Glencoe.

The locations of the points with carriageway width restrictions are shown in Figures 7.1a to 7.1f. A photographic record of each point is shown in Figures 7.2a to 7.2e.

The accident records at these points for the 5-year period between 1999 and 2003 were examined to investigate possible relationships between the narrow carriageway and road safety issues. For this assessment, it was assumed that any accident within 100 metres of either side of the restriction, depending on the description of the accident, could be attributed to the narrow carriageway. The results of this assessment are presented below.

It is also noted that, as many of the locations are associated with bridges, more detailed examinations may be required to confirm that where hardstrips are provided adjacent to the edges of the carriageway, they continue at the same width through or over the structure, as indicated in TD 27/96 Cross-Sections at Structures.

7.2 Localised Carriageway Width Restrictions

Restricted Width Location 3 – Chainage 7.18km, Creag an Arnain

At this location, the carriageway narrows at a bridge. One serious accident occurred in 2002 where a car collided with the side of another car.

Restricted Width Location 4 – Chainage 8.9km, Ardvorlich

At this location, the carriageway narrows at a bridge. There is also a crash barrier around a mature tree that is located at the edge of the carriageway. Two accidents occurred at this location. One minor accident occurred in 2002 where a northbound vehicle hit the rear of another vehicle, possibly due to the lead vehicle slowing as it entered the narrow section. The second accident, which was recorded as a serious injury, does not appear to be related to the narrow carriageway at this location.

Restricted Width Location 6 / 7 - Chainage 14.245km / 14.31km, Ardlui Church

Two locations have been identified on this section where the carriageway narrows to cross two bridges. A minor accident occurred in 2003 involving a collision with 2 oncoming vehicles, 1 of the vehicles was a minibus, the other vehicle was a car.

Restricted Width Location 9 - Chainage 26.71km, Railway Bridge, Crianlarich

The A82 carriageway narrows as it passes under the railway bridge at this location to the north of Crianlarich. A total of four accidents occurred at this location, 1 serious and 3 minor accidents. The serious accident in 2003 occurred when 2 oncoming vehicles collided on the approach to the railway bridge. A minor accident occurred in 1999 when a car and a heavy goods vehicle collided under the railway bridge. Another minor accident occurred in 2000 when a car and a motorcycle collided side-on as they travelled under the railway bridge. The remaining minor accident occurred in 2003 and was the result of a collision between 2 oncoming cars, as one approached the railway bridge, the other heading away from it.

Restricted Width Location 10 - Chainage 43.65km, Allt Kinglass

At this location, the carriageway narrows as it crosses a bridge. One serious accident occurred at this location in 1999 when multiple collisions occurred between 4 vehicles, a bus, two cars and a motorcycle.

Restricted Width Location 11 - Chainage 50.1km, Loch Tulla

At this location, the bridge structure is close to the edge of the running lane. Two accidents occurred at this location, including 1 serious and 1 slight accident. The serious accident occurred in 2002 and was the result of a collision between a light goods vehicle and a pedestrian. The pedestrian may have been attempting to walk across the bridge and, as there is no footpath or verge at this location, the vehicle struck the pedestrian. The minor accident occurred in 1999 and was the result of a collision between two oncoming cars.

Restricted Width Location 13 - Chainage 56.92km, Rannoch Moor

The bridge parapet is close to the edge of the running lane at this location. Two accidents occurred at this location, both of which were minor. One minor accident occurred in 2000 and was the result of a car colliding with an object, presumably the bridge, and the driver losing control of the vehicle. The other minor accident occurred in 2003 and was the result of a side-on impact between 2 cars passing over the bridge causing them to lose control.

Restricted Width Location 16 - Chainage 63.235km, S of Glencoe Ski Centre

The bridge parapet is close to the edge of the running lane at this location. Two accidents occurred at this location including 1 serious and 1 slight accident. The serious accident involved a collision between a motorcycle crossing the bridge in the northbound direction and a pedestrian crossing the bridge. The pedestrian may have been attempting to walk across the bridge and, as there is no footpath or verge at this location, was struck by the vehicle.

Restricted Width Location 17 - Chainage 65.3km, South of Glencoe Ski Centre

The bridge structure is close to the edge of the running lane at this location. Two accidents occurred at this location, including 1 serious and 1 slight accident. The minor accident occurred when the driver of a northbound vehicle lost control as it crossed the bridge, possibly due to the driver misjudging the width of the bridge. The serious accident occurred in 2000 and appears to have the same cause as the minor accident.

Restricted Width Location 19 - Chainage 73km, Laraig Eilde

The bridge parapet is close to the edge of the running lane at this location. One minor accident occurred at this location in 2000 and occurred when a car collided with an object, presumably the bridge structure.

Restricted Width Location 20 - Chainage 73.66km, Allt-na-righ

The bridge parapet is close to the edge of the running lane at this location. One serious accident occurred at this location in 2003 and was the result of a motorcycle rider losing control as they crossed the bridge, possibly misjudging the carriageway width and breaking sharply, causing them to lose control.

Restricted Width Location 21 - Chainage 73.75km

At this location, the carriageway narrows as it crosses a bridge. One serious accident occurred at this location in 2003 and was the result of a car driver losing control as they crossed the bridge, possibly misjudging the carriageway width and breaking sharply, causing them to lose control.

Restricted Width Location 23 - Chainage 76.075km

The bridge parapet is close to the edge of the running lane at this location. One serious accident occurred at this location in 2001 and was the result of multiple collisions between two cars and a light goods vehicle.

Restricted Width Location 24 - Chainage 78km, Loch Achriochtan

At this location, the carriageway narrows as it crosses a bridge. Three accidents have occurred at this location, including 2 serious and 1 slight accident. One serious accident occurred in 1999 and was the result of a collision between 2 oncoming cars

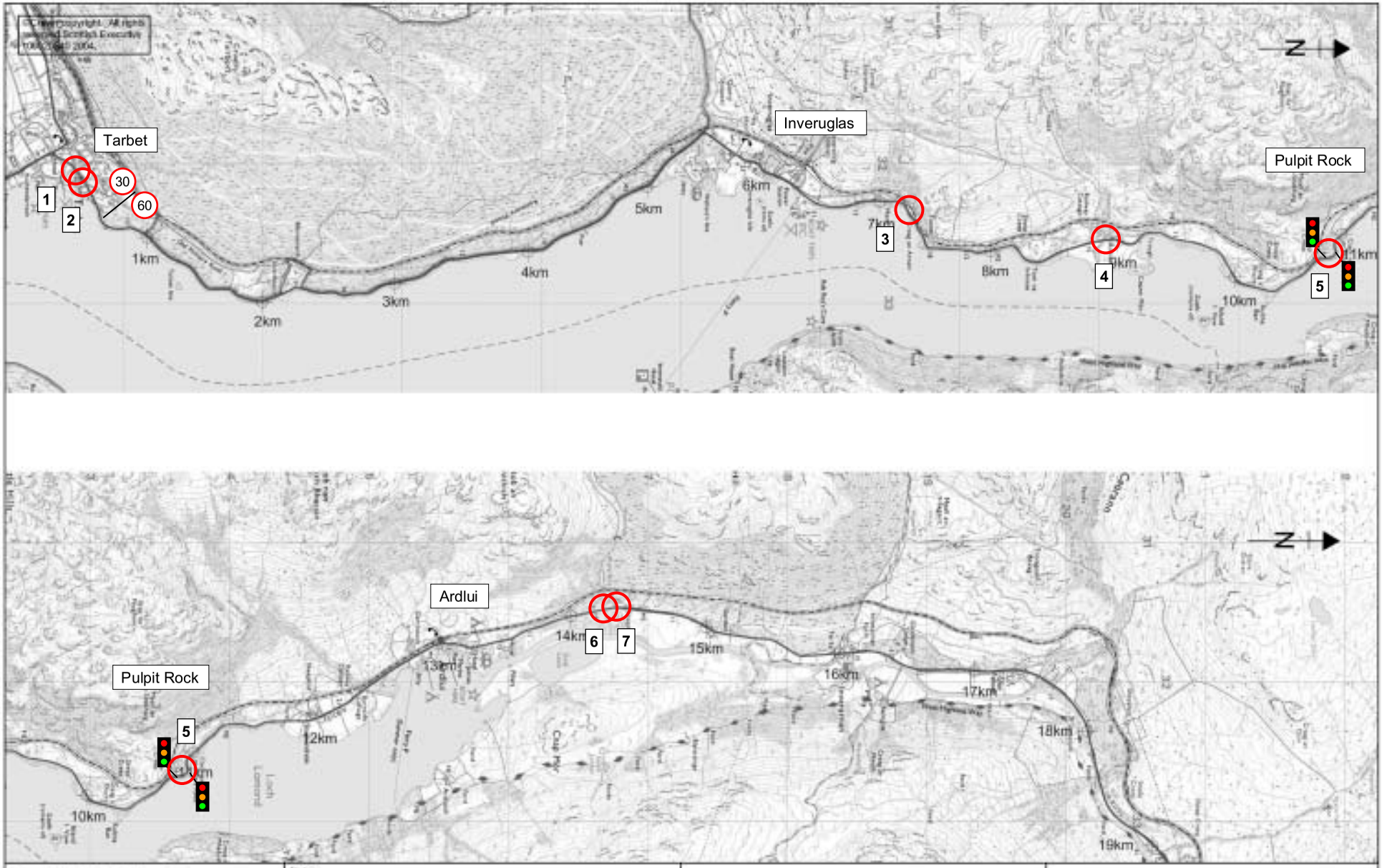
as they crossed the bridge. The other serious accident occurred in 2000 when a car collided with a pedestrian. The pedestrian may have been attempting to walk across the bridge and, as there is no footpath or verge at this location, was struck by the vehicle. The slight accident occurred in 2001 and was the result of multiple collisions between 3 cars and a bus as they crossed the bridge.

Additional Restricted Width Locations

In addition to the locations identified above, points of reduced carriageway width have been identified at the following ten locations, but these do not appear to be associated with any road safety issues:

- Restricted Width Location 1 – Chainage 0.20km, Tarbet
- Restricted Width Location 2 – Chainage 0.32km, Tarbet
- Restricted Width Location 5 - Chainage 10.7km, Pulpit Rock
- Restricted Width Location 8 - Chainage 26.46km, Railway Bridge, Crianlarich
- Restricted Width Location 12 - Chainage 55.9km, Rannoch Moor
- Restricted Width Location 14 - Chainage 62.75km, Rannoch Moor
- Restricted Width Location 15 - Chainage 63.8km, North of Glencoe Ski Centre
- Restricted Width Location 18 - Chainage 68.9km, Altnafeadh
- Restricted Width Location 22 - Chainage 75.37km
- Restricted Width Location 25 - Chainage 81.93km, Allt Fhlodhan

The above information indicates that the localised width restrictions adversely affect conditions at some locations along the A82, and consequently local widening of these sections should be considered as part of the improvement options.



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Speed Limit 60 | 30

Carriageway Constraint Point & Reference 1

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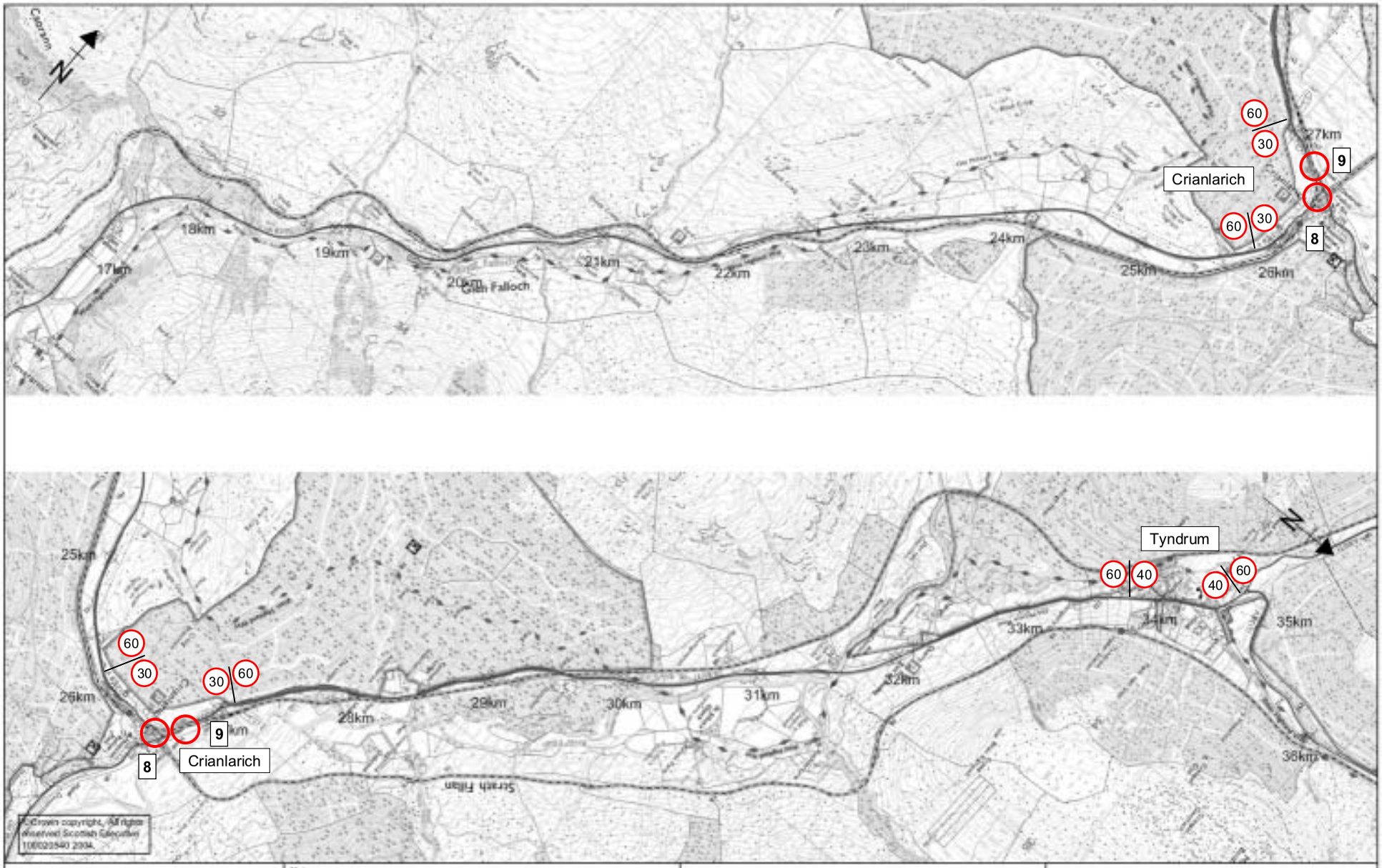
Firm Strategy Report

Figure 7.1a
Carriageway Width Restrictions



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Carriageway Constraint Point & Reference 1

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Figure 7.1b
Carriageway Width Restrictions

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Carriageway Constraint Point & Reference 1

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Figure 7.1c
Carriageway Width Restrictions

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Carriageway Constraint Point & Reference 1

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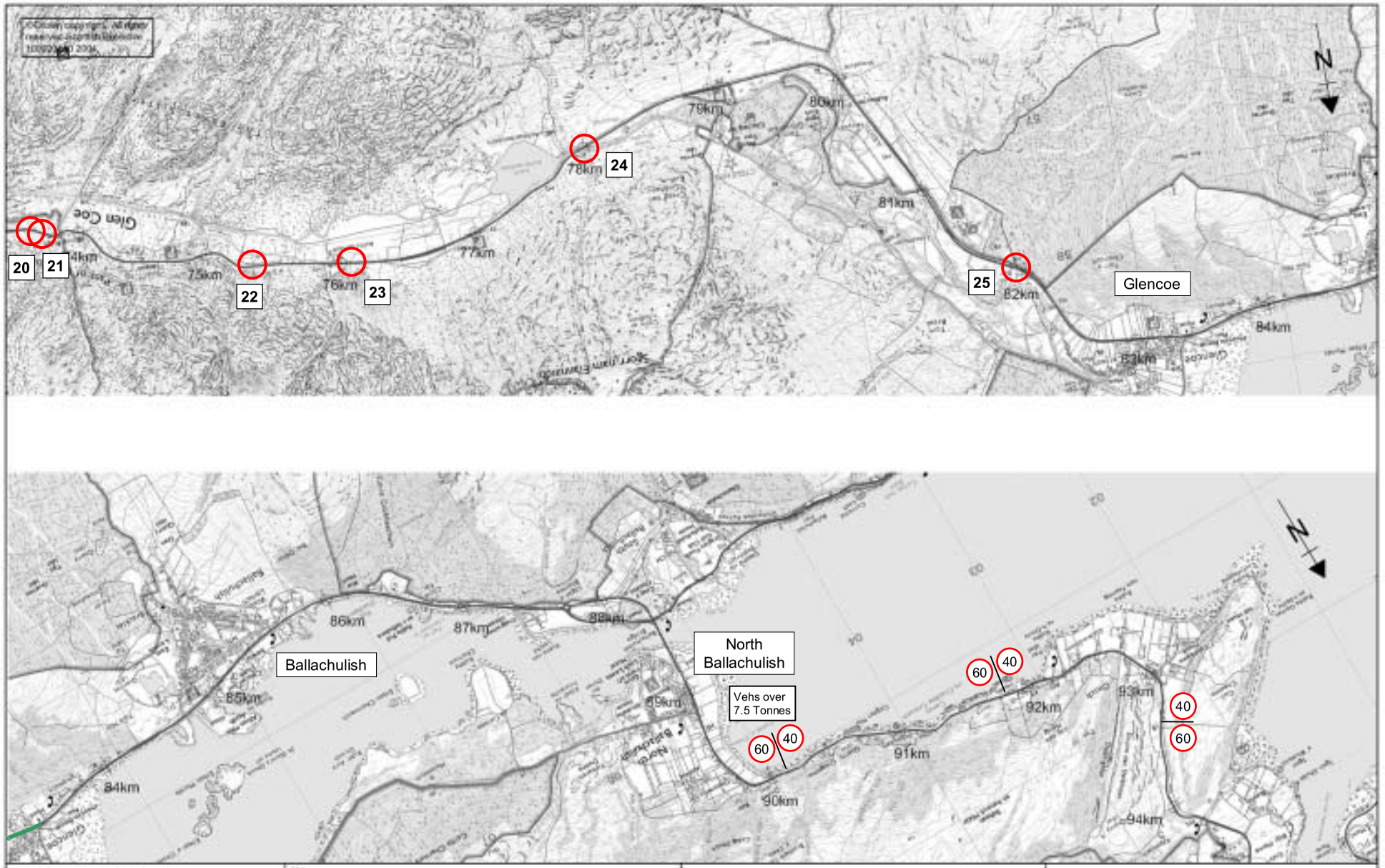
Figure 7.1d
Carriageway Width Restrictions



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Carriageway Constraint Point & Reference 1

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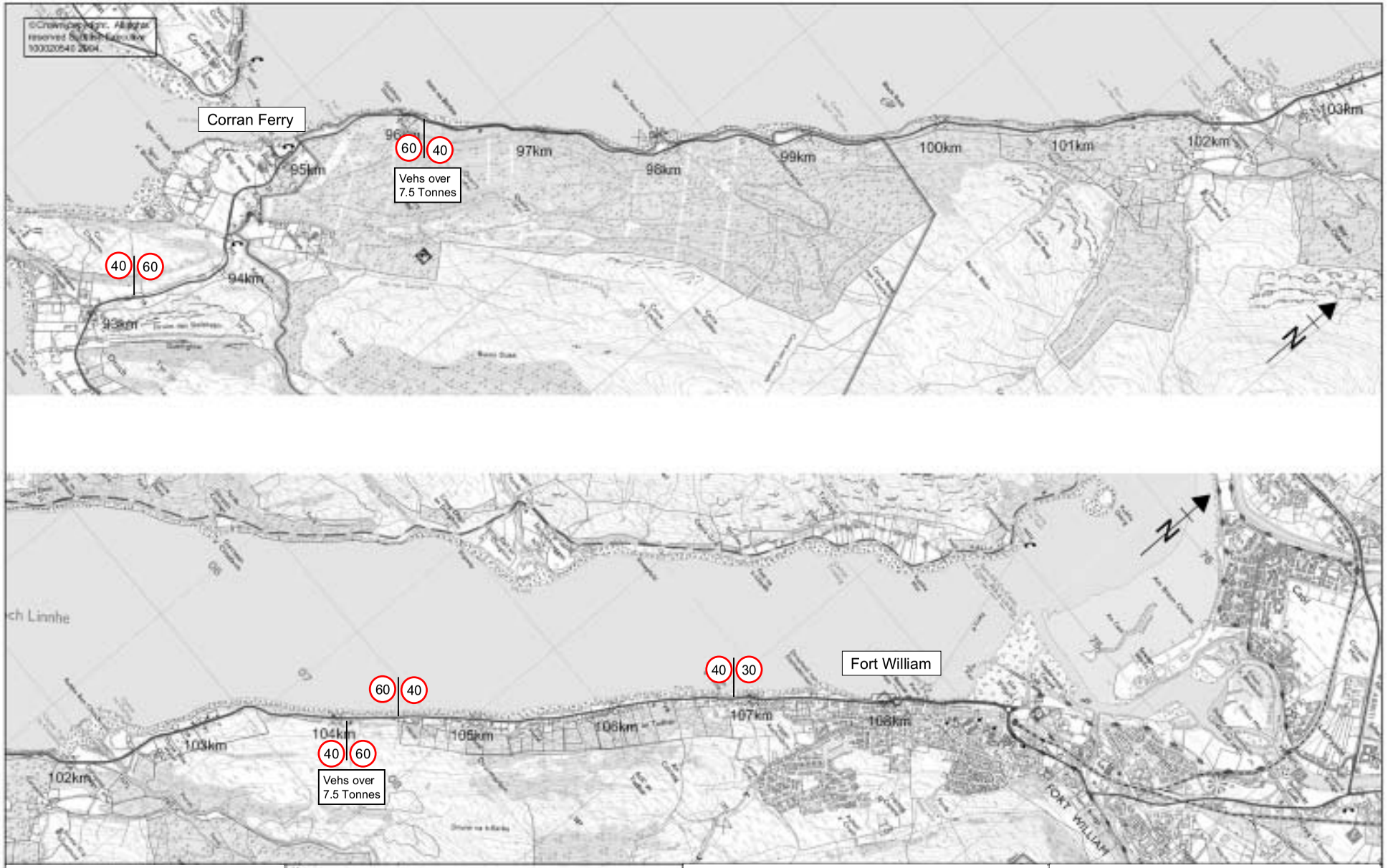
Figure 7.1e
Carriageway Width Restrictions



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Carriageway Constraint Point & Reference 1

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Figure 7.1f
Carriageway Width Restrictions

1 – Chainage 0.2km Tarbet

2 – Chainage 0.32km Tarbet

3 – Chainage 7.18km Creag an Arnain

4 – Chainage 8.9km Ardvorlich

5 – Chainage 10.7km Pulpit Rock

6 – Chainage 14.245km Ardlui Church

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Figure 7.2a
Photographic Record of Carriageway Width Restrictions

7 – Chainage 14.31km Ardlui Church

8 – Chainage 26.46km Railway Bridge, Crianlarich

9 – Chainage 26.71km Railway Bridge, Crianlarich

10 – Chainage 43.65km Allt Kinglass

11 – Chainage 50.1km Loch Tulla

12 – Chainage 55.9km Rannoch Moor

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Figure 7.2b
Photographic Record of Carriageway Width Restrictions

13 – Chainage 56.92km Rannoch Moor

14 – Chainage 62.75km Rannoch Moor

15 – Chainage 63.8km North of Glencoe Ski Centre

16 – Chainage 64.235km North of Glencoe Ski Centre

17 – Chainage 65.3km North of Glencoe Ski Centre

18 – Chainage 68.9km Altnafeadh

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Figure 7.2c
Photographic Record of Carriageway Width Restrictions

19 – Chainage 73km Laraig-Eilde

20 – Chainage 73.66km Allt-na-righ

21 – Chainage 73.75km

22 – Chainage 75.37km

23 – Chainage 76.075km

24 – Chainage 78km Loch Achtriochtan

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Figure 7.2d
Photographic Record of Carriageway Width Restrictions

25 – Chainage 81.93km Allt Fhlodhan

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Figure 7.2e
Photographic Record of Carriageway Width Restrictions

8. LAY-BYS AND REST AREAS

8.1 Introduction

A82 route attracts a high volume of tourists, particularly during the summer months and experiences one of the highest seasonal variations in traffic flows on the Scottish trunk road network. As part of the Route Action Plan study, an examination of the lay-bys and rest areas along the A82 route was undertaken to consider the requirements for providing suitable lay-bys, rest areas and picnic areas along the route.

Guidance on the location and layout of lay-bys and rest areas is contained in DMRB Volume 6, Section 3, Part 3 TA69/96 - The Location and Layout of Lay-bys, and DMRB Volume 6 TA 57/87 – Roadside Features.

8.2 Guidance on Provision of Lay-bys and Rest Areas along the A82

Lay-Bys

A range of factors should be taken into account when considering the location of a new lay-by. In accordance with TA 69/96, siting of lay-bys should be avoided on the inside of curves, at locations near junctions and signing, at sharp crests, in the vicinity of bridges and other structures and at the bottom of gradients where visibility is not adequate. Lay-bys should be located on both sides of the road but should not be directly opposite one another but should be configured to a left-right stagger and be at least 150 metres apart. The use of redundant highway as lay-bys without reference to design standards should be avoided.

The desirable frequency of conventional lay-bys on single carriageway roads is dependent on traffic flows. In the case of the A82, where the AADT is generally in the 2500-8000 vehicles range, the lay-bys should be at a frequency of 5 to 8 kms. For single carriageway routes with a AADT flow of less than 8000 vehicles, provision of either a lay-by Type A, when traffic speeds along the route are high and a physical separation from the carriageway is desirable, or Type B, where traffic speeds are generally lower and traffic volumes lighter and a physical separation is not required, should be implemented.

Rest Areas

Rest areas may be provided on rural roads as a safe place for motorists to pull off the highway and leave their vehicle. TA 57/87 states that Rest Areas incorporating picnic sites can be provided on rural trunk roads and these may include toilets and facilities for the provision and consumption of meals and refreshments.

In determining the provision of rest areas incorporating picnic sites, TA 57/87 recommends that they should not be sighted at more than 45km intervals on each side of the road in addition to lay-bys and preferably no further than 30 minutes driving time apart.

Closer spacing of rest areas may be needed on roads attracting holiday traffic and in circumstances where demand is high for off-carriageway stopping, the construction of rest areas incorporating picnic sites may be a preferred alternative to the usual lay-by provision. This is likely to be appropriate for recreational areas such as national parks, where the picnic area might be a journey destination rather than an interim stopping place.

In some cases, it will be possible for a picnic site to serve a secondary purpose, such as the base for forest walks or nature trails.

8.3 Improvement Options

Based on the guidelines set out in DMRB, the basis for improving lay-bys and rest areas along the A82 is as follows;

- Provision of lay-bys of either Type A or B depending on constraints within 5 to 8km along the route and on each side of the carriageway;
- Rationalisation of the number of lay-bys on sections where the interval exceeds the minimum distance of 5km;
- Provision of Rest Areas within 45km intervals along the route and on each side of the carriageway; and
- Provision of picnic sites at key locations of public interest, (Loch Lomond, Glencoe, Loch Linnhe) etc.

The locations of existing lay-bys and rest/picnic areas along the A82 are shown in Figures 8.1a to 8.1f.

Tarbet to Pulpit Rock (Ch 0-11km)

Lay-by provision on this section is currently below standard, with at total of 4 parking areas of a poor standard, which are merely areas of hard standing at the side of the carriageway, although it is recognised that the local topography and road geometry are such that few locations are suitable. There are also 2 designated picnic sites within this section, at Tarbet and Inveruglas, both of which are located on the southbound carriageway.

To satisfy the requirements of DMRB, new standard lay-bys should be provided on this section and the current areas of hard standing should be removed. The provision of an upgraded carriageway over this section would provide an opportunity to construct higher quality lay-bys with views over Loch Lomond.

The lay-by at Pulpit Rock has the potential to be replaced by a picnic site on the northbound carriageway, depending on the available land, to open up the opportunity for the public to view the monument.

Pulpit Rock to Crianlarich (Ch 11-26.5km)

Current lay-by provision adheres to the recommended siting distances with seven parking areas, three northbound and four southbound although some of these lay-bys are of a low standard.

To satisfy the requirements set out in DMRB, new standard lay-bys should be provided to replace the hard standing that currently exists at some locations.

The possible replacement of an existing lay-by by a picnic area on the southbound carriageway at Falls of Falloch (Ch 19.5km) could provide an opportunity for visitors to stop and enjoy the picturesque surrounding area and waterfall. The picnic site could also act as a stopping point on the West Highland Way where toilets and/or refreshment facilities could be provided.

Crianlarich to Tyndrum (Ch 26.5-34.5km)

This section of carriageway is above average standard for the route and currently has three northbound and two southbound lay-bys, all of which are designated with a parking sign. There may be the need to rationalise the lay-bys along this section, as currently, three northbound lay-bys are sited within a 4.5km length of carriageway.

Rationalisation of the three existing northbound lay-bys and provision of a new standard lay-by at chainage 32km is in accordance with DMRB guidelines.

Tyndrum to South of Glencoe (Ch 34.5-71km)

Current lay-by provision on this section of the A82 is of a reasonable standard, with off-road parking at Loch Tulla and mainly signposted, designated parking areas. Some rationalisation of the lay-bys may be necessary as many of lay-bys are less than the 5 km apart.

There may also be an opportunity to include a picnic area in the Loch Tulla area on the southbound side of the carriageway in this section where lay-by provision does not currently meet the DMRB guidelines. A picnic site could also be implemented on the northbound side of the carriageway.

Siting of these rest areas would provide drivers with the opportunity to view Loch Tulla from an elevated position and would provide a pleasant setting for tourists.

Glencoe (Ch 71-75km)

Tight geometry and poor sight distances make the use of standard lay-bys difficult through this section. Current lay-by provision is sub-standard with the majority being merely an area of hard standing at the roadside with no proper facilities or safe, defined entry or exit points. There is also a series of lay-bys at less than 1km intervals along this section which are very popular and are heavily used by tourists and visitors during the summer periods.

Where possible, lay-bys should be separated from the main carriageway by a segregation island or an area of raised kerbing. As the numbers of visitors who leave their vehicles in these enlarged lay-bys to enjoy in the area increases, there is the potential for parked vehicles to overflow on to the carriageway with a consequential adverse impact on road safety.


Segregating the lay-bys from the main carriageway and providing proper car parking in this area, which reflects the sensitive environment of Glencoe, should address potential road safety concerns and enhance the experience of the visitors and tourists.

North of Glencoe to Corran Ferry (Ch 75-95km)

The majority of this section of the A82 is of a good standard and passes through the villages of Glencoe, Ballachulish and Onich. A clearway currently exists over a 1km section where the route passes over the Ballachulish Bridge.

There are currently 9 lay-bys in this section, 4 southbound and 5 northbound, with all being designated signposted lay-bys. Northbound lay-bys to the south of Glencoe Village could be rationalised as they fall well below the 5km minimum spacing. There is also the opportunity for a new northbound lay-by within this section as currently there is a 12.75km gap in the northbound lay-bys between Glencoe Village and Corran Ferry. This would provide a stopping area for tourists to view Loch Leven.

There is scope for addition of picnic areas the northbound carriageway at Loch Achtriochtan and on the southbound carriageway along Loch Leven at Ballachullish, both dependent upon land availability.

Corran Ferry to Fort William (Ch 95-108km)

The section of the route that follows the eastern edge of Loch Linnhe has some sections of tight geometry and poor sight distances with few overtaking opportunities. Current lay-by provision is inconsistent with the standard 5-8km with too many lay-bys within a very short space of carriageway, in the northbound direction, and too few lay-bys in the southbound direction. Where possible, new lay-bys should be provided on the southbound carriageway in accordance with DMRB standards. The number of northbound lay-bys should be rationalised to meet guidelines where possible.

Based on the above, the following notes provide an indication of the route improvement options for lay-bys and rest areas along the route:

Where possible, lay-bys should be restricted to a minimum of intervals of 5km and a maximum of 8km. Lay-bys that currently exceed these limits should be rationalised to meet the guidelines, unless there are specific adverse implications for road users.

In addition to the existing picnic sites at Tarbet, Inveruglas and Sgeir na Sean Chroit on Loch Linnhe, the following sites could be added to the route depending on land availability.

- upgrading the lay-by at Pulpit Rock on the northbound side of the carriageway to a picnic area (Ch 11km)
- an addition of a picnic area at the Falls of Falloch on the southbound side of the carriageway (Ch 19.5km)
- an additional picnic area at Loch Tulla on the northbound side of the carriageway (Ch 47km)
- an additional picnic area at Loch Tulla on the southbound side of the A82 (Ch 49.5km)
- an additional picnic area at Loch Achtriochtan to the north of Glencoe on the northbound carriageway (Ch 78.5km)
- an additional picnic area on Loch Leven at Ballachullish on the southbound carriageway (Ch 84.5km)

Implementation of these sites would provide a maximum interval of 36km between the sites, which is within the 45km set out in TA 57/87.

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Speed Limit 60 30

Picnic Area

Emergency Telephone

Roadside Parking (Designated with Sign) P

Car Parks Cp

Lay-By (Short areas of Hard Standing Surfacing to full Lay-Bys) Lb

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Figure 8.1a
Existing provision of Lay-bys and Rest Areas

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Speed Limit 60 | 30

Picnic Area

Emergency Telephone

Roadside Parking (Designated with Sign) P

Car Parks Cp

Lay-By (Short areas of Hard Standing Surfacing to full Lay-Bys) Lb

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Figure 8.1b
Existing provision of Lay-bys and Rest Areas

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Speed Limit 60 | 30

Picnic Area

Emergency Telephone

Roadside Parking (Designated with Sign) P

Car Parks Cp

Lay-By (Short areas of Hard Standing Surfacing to full Lay-Bys) Lb

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Figure 8.1c
Existing provision of Lay-bys and Rest Areas

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Speed Limit 60 30

Picnic Area

Emergency Telephone

Roadside Parking (Designated with Sign) P

Car Parks Cp

Lay-By (Short areas of Hard Standing Surfacing to full Lay-Bys) Lb

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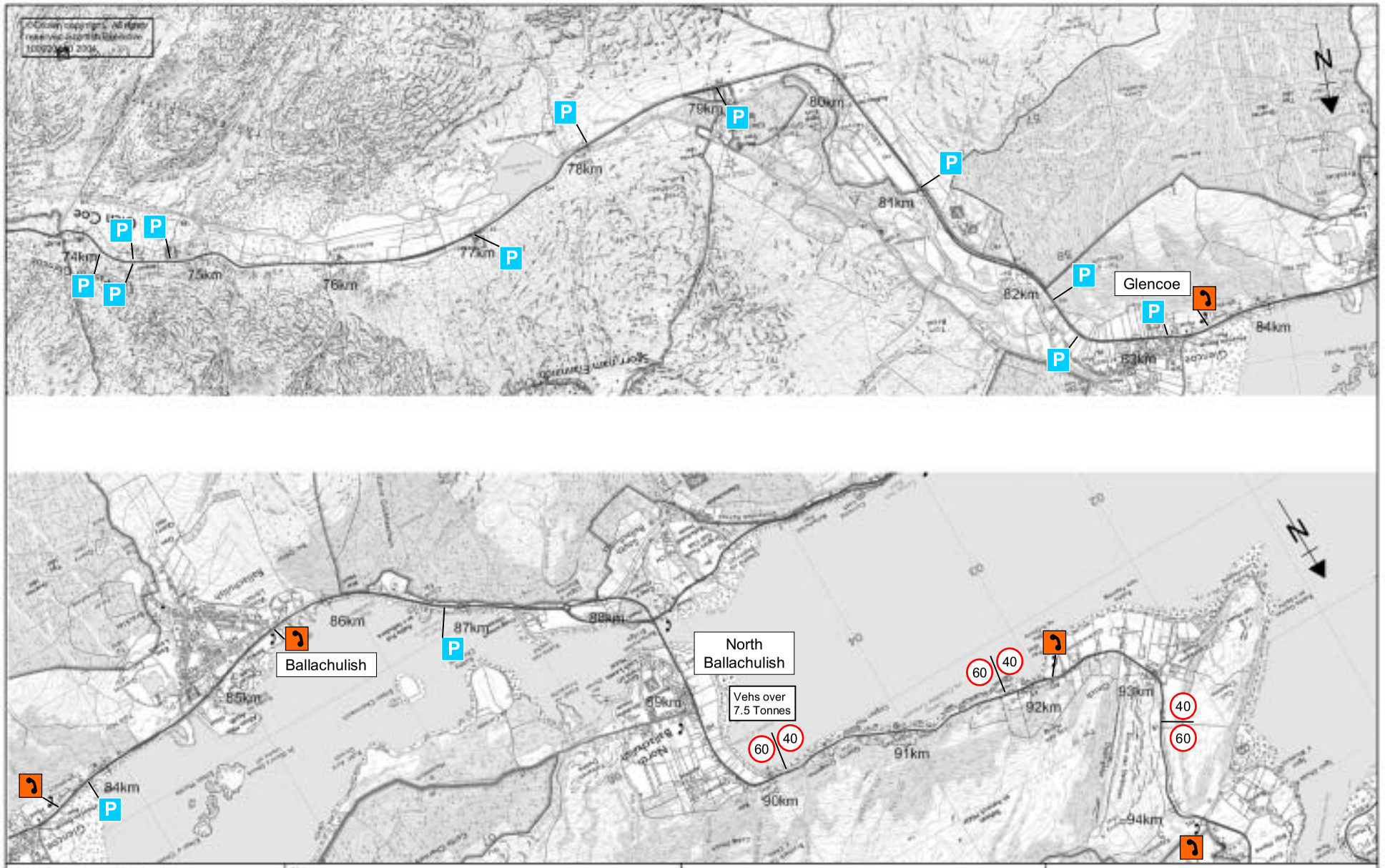
Figure 8.1d
Existing provision of Lay-bys and Rest Areas



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Speed Limit 60 / 30

Picnic Area

Emergency Telephone

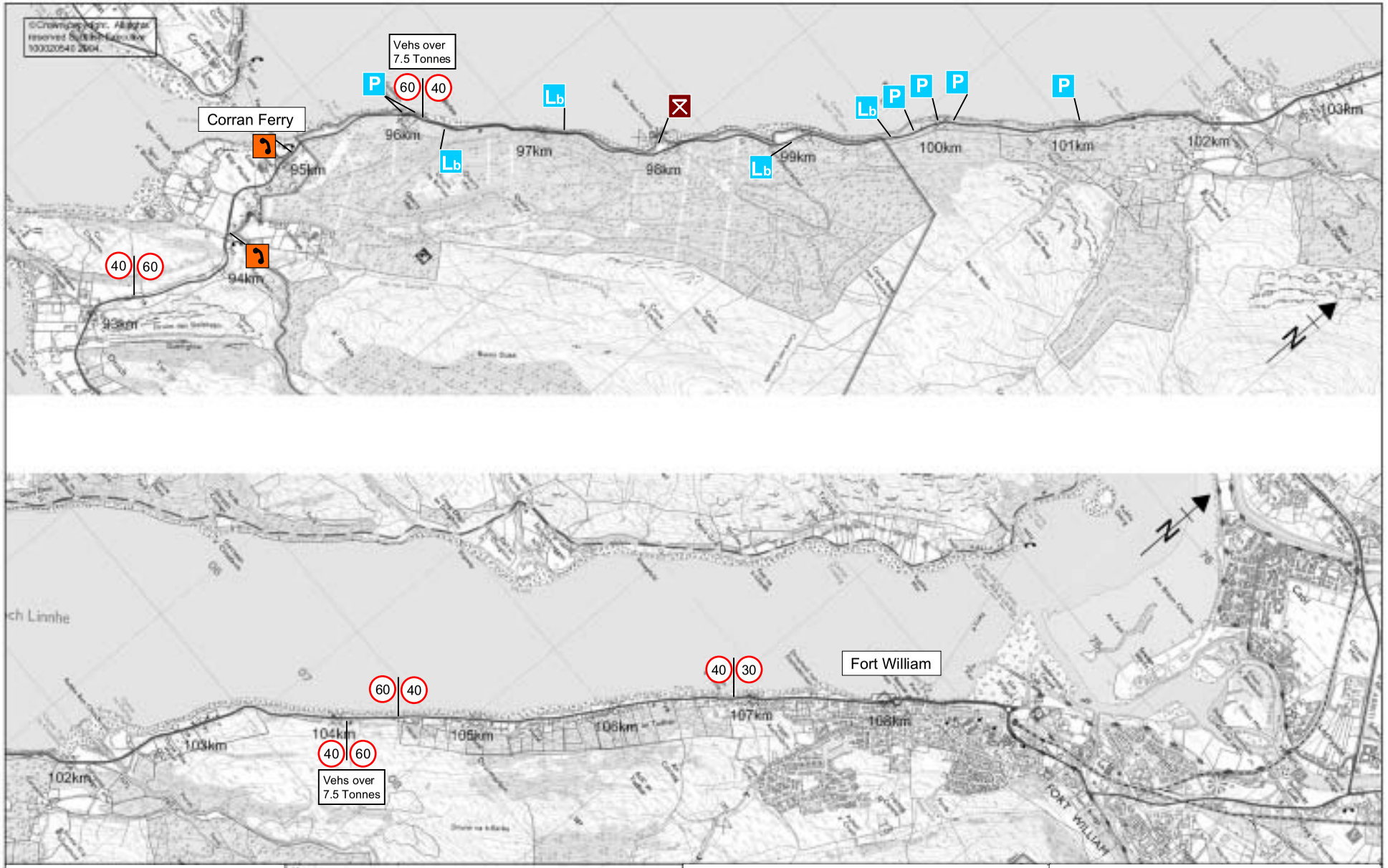
Roadside Parking (Designated with Sign) P

Car Parks Cp

Lay-By (Short areas of Hard Standing Surfacing to full Lay-Bys) Lb

A82 Tarbet to Fort William
Route Action Plan Study
Firm Strategy Report

Figure 8.1e
Existing provision of Lay-bys and Rest Areas



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Speed Limit 60 | 30

Picnic Area

Emergency Telephone

Roadside Parking (Designated with Sign) P

Car Parks Cp

Lay-By (Short areas of Hard Standing Surfacing to full Lay-Bys) Lb

A82 Tarbet to Fort William Route Action Plan Study
Firm Strategy Report

Figure 8.1f
Existing provision of Lay-bys and Rest Areas

9. PEDESTRIANS AND CYCLISTS

A review of the existing provision for pedestrians and cyclists along the route has been undertaken as part of the development of the Route Action Plan.

Currently the facilities for pedestrians and cyclists who wish to use the A82 are limited. With the exception of short sections of footpath in Tarbet, Sloy Power Station, Crianlarich, Tyndrum, Glencoe village, Ballachulish Bridge, Onich, Corran Ferry and Fort William, the majority of the route has no dedicated facilities for pedestrians or cyclists despite being a popular tourist and recreational route and the close proximity of the West Highland Way.



Points of Interface along the A82 route

A number of points of interface exist between pedestrians and road traffic along the route where the West Highland Way crosses the A82 trunk road. These points occur at the following locations and are shown on Figures 9.1a to 9.1f:

1. Chainage 22.7km – north of Glen Falloch
2. Chainage 30.1km – Mountgreenan, north of Crianlarich
3. Chainage 31.6km – north of Crianlarich
4. Chainage 34.7km – Tyndrum
5. Chainage 44.9km – Bridge of Orchy
6. Chainage 63.4km – Glencoe Ski Centre
7. Chainage 68.0km – south of the Pass of Glencoe
8. Chainage 68.8km – south of the Pass of Glencoe

The road traffic accident records for the 5-year period between 1999 and 2003 were examined to assess the extent to which these points of interface correlate with road safety issues. The results of this examination indicate that no pedestrian or cyclist related accidents have occurred at these points.

Pedestrian and Cyclist Traffic Accidents along the A82

Although no pedestrian or cyclist related accidents have occurred at the points on interface between the A82 and the West Highland Way, there have been a number of accidents involving pedestrians and cyclists along the route during the 5-year period between 1999 and 2003. The locations of all personal injury accidents recorded during this period involving pedestrians or cyclists are also shown in Figures 9.1a to 9.1f.

Each accident is identified by a unique set of information that indicates the date/direction/event and the result and surface conditions of the each accident. The number of vehicles, and vehicle categories, the casualty numbers and severities are also recorded for each accident on the A82. To assist in identifying the various categories of accidents the fatal, serious and slight accidents are colour-coded red, blue and green respectively.

Details of Pedestrian and Cyclists Accidents

One serious PIA occurred at Chainage 23.7km, south of Crianlarich, in August 1999. This accident occurred when a southbound car collided with a pedestrian. It was noted that the road surface was wet at the time of this accident.

One slight PIA occurred at Chainage 33.9km, Tyndrum, in September 2001. This accident occurred when a car heading southbound collided with a pedestrian. It was noted that the road surface was wet at the time of this accident.

One slight PIA occurred at Chainage 34.0km, Tyndrum, in October 1999 where a bus lost control and collided with a pedestrian. It was noted that the road surface was wet at the time of this accident.

One serious PIA occurred at Chainage 35.8km, north of Tyndrum, in June 2000, where a car lost control and collided with a pedestrian.

There was 1 serious PIA at Chainage 38.4km, south of Bridge of Orchy, in July 2000, which involved a car heading southbound losing control on a left hand bend and colliding with a cyclist.

One serious PIA occurred at Chainage 50.0km, Loch Tulla, in August 2002, where a light goods vehicle lost control and collided with a pedestrian.

One fatal PIA occurred at Chainage 54.9km, 400m north of Highland Boundary, in August 1999, where a car heading southbound lost control and collided with a pedestrian.

One slight PIA occurred at Chainage 64.9km, Rannoch Moor, in July 1999. This accident occurred when a northbound car collided with a pedestrian while overtaking.

One serious PIA occurred at Chainage 78.0km, Loch Achtriochtan, in December 2000. This accident occurred when a northbound car collided with a pedestrian. It was noted that the road surface was wet at the time of this accident.

One slight PIA occurred at Chainage 82.1km, south of Glencoe Village, in June 2000, where a car heading southbound collided with a pedestrian.

One slight PIA occurred at Chainage 88.2km, South Ballachulish, in April 2003, where a car heading northbound collided with a pedestrian.

One slight PIA occurred at Chainage 99.2km, Corrychurrachan, in August 2002. This accident occurred when a southbound minibus collided with a pedestrian.

One slight PIA occurred at Chainage 105.5km, south of Fort William, in September 1999. This accident occurred when a northbound car performed an overtaking manoeuvre to pass 2 cyclists, which resulted in a southbound car losing control and colliding with a second northbound car. It was noted that the road surface was wet at the time of this accident.

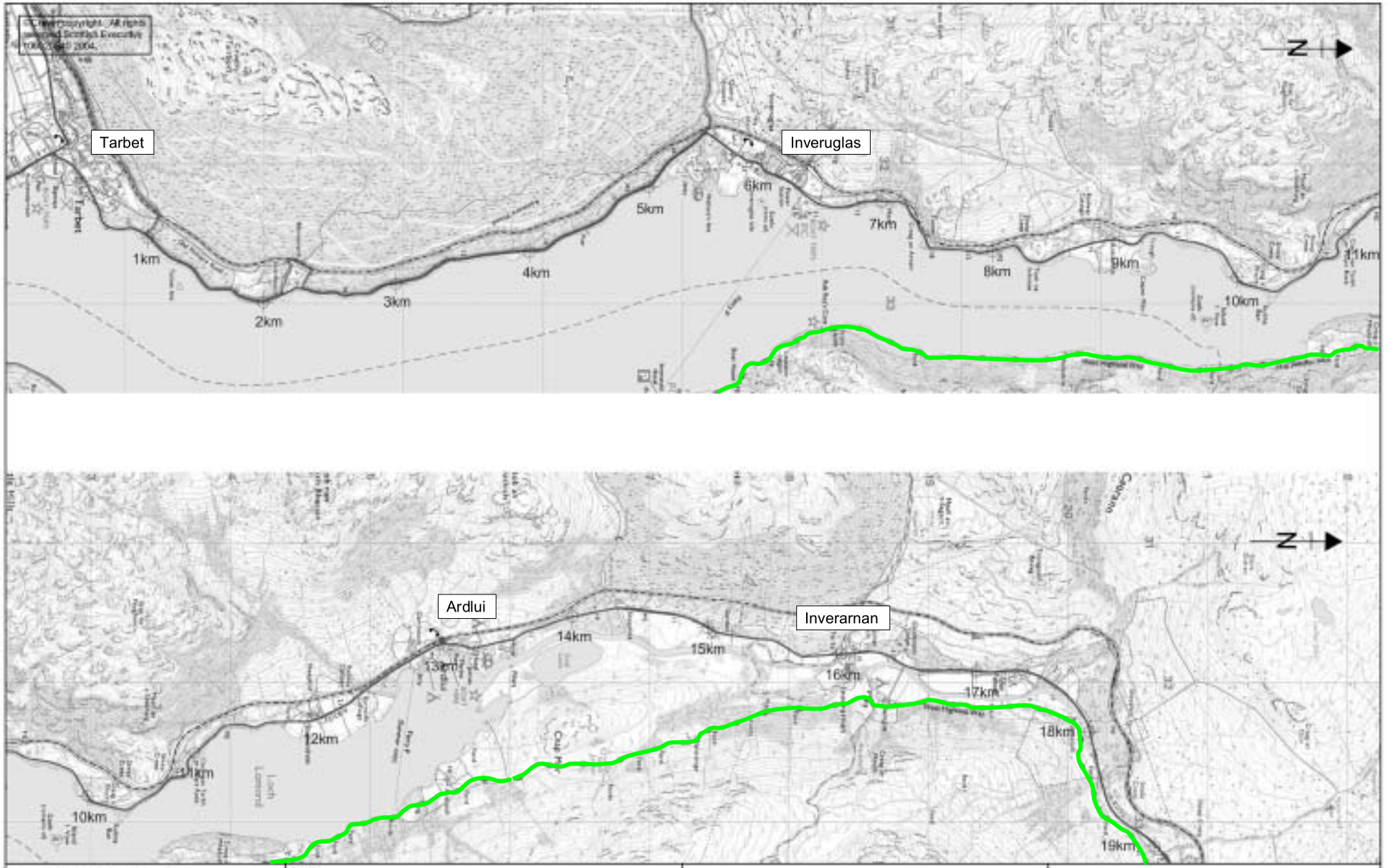
One serious PIA occurred at Chainage 106.2km, south of Fort William, in June 2001, where a light goods vehicle heading southbound collided with a pedestrian.

One slight PIA occurred at Chainage 107.2km, Fort William, in August 1999, where a heavy goods vehicle heading southbound collided with a pedestrian.

One slight PIA occurred at Chainage 107.4km, Fort William, in June 1999, where a light goods vehicle heading northbound collided with a pedestrian.

One slight PIA occurred at Chainage 107.5km, Fort William, in March 2003, where a car heading southbound collided with a pedestrian.

Based on the above, it appears that although 15 accidents involving pedestrians and 2 accidents involving cyclists occurred on the A82 trunk road during the 5-year period between 1999 and 2003, none of these accidents occurred at the specific pedestrian crossing points. The majority of accidents were caused by vehicles colliding with pedestrians at the roadside, and consequently the provision of improved facilities should be considered as part of the improvement options to provide a safer route for all road users including pedestrians and cyclists.



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West Highland Way

Crossover / Conflict Point with A82 & Reference 1

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Figure 9.1a
Pedestrians and Cyclist Details

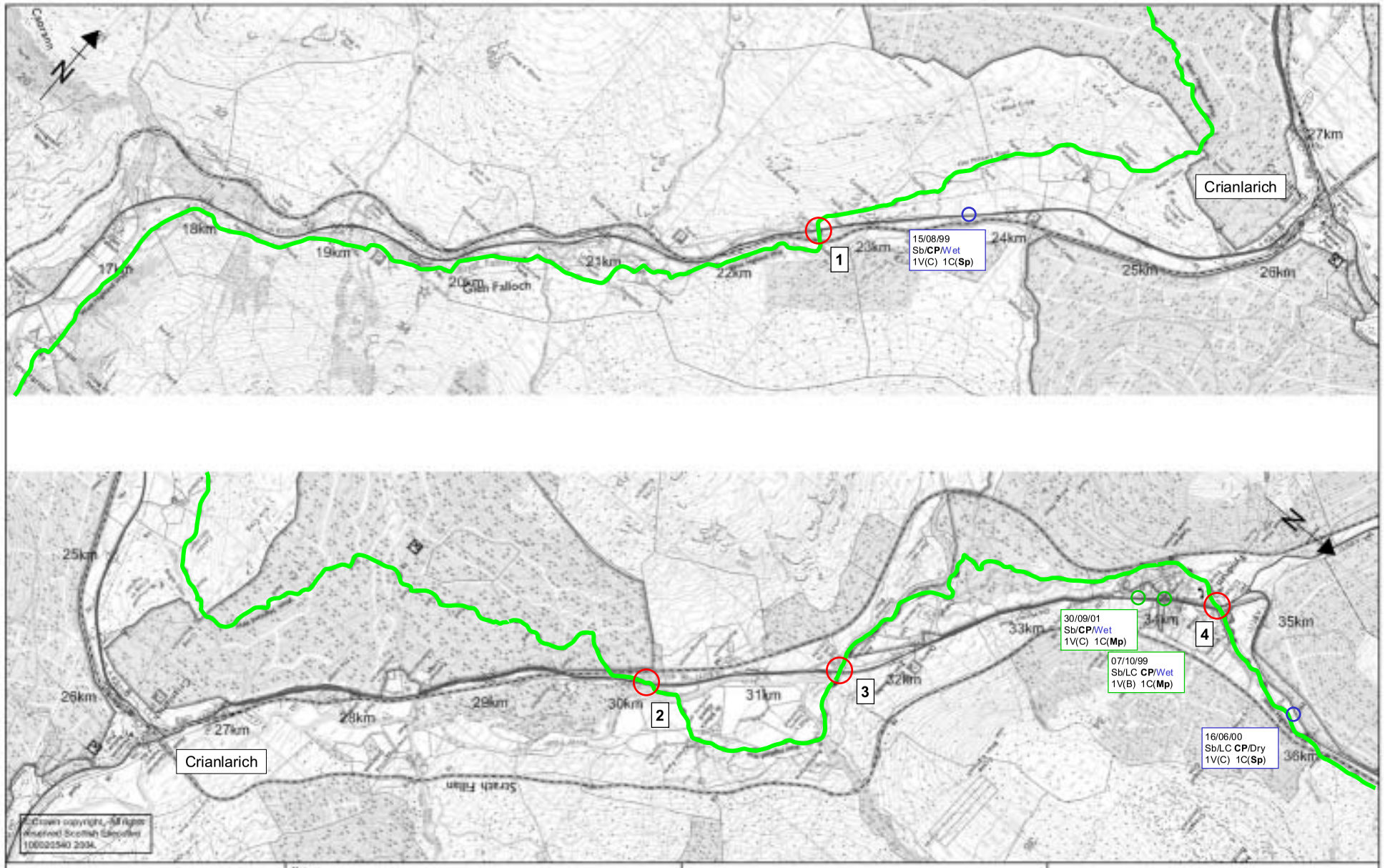

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Figure 9.1b
Pedestrians and Cyclist Details

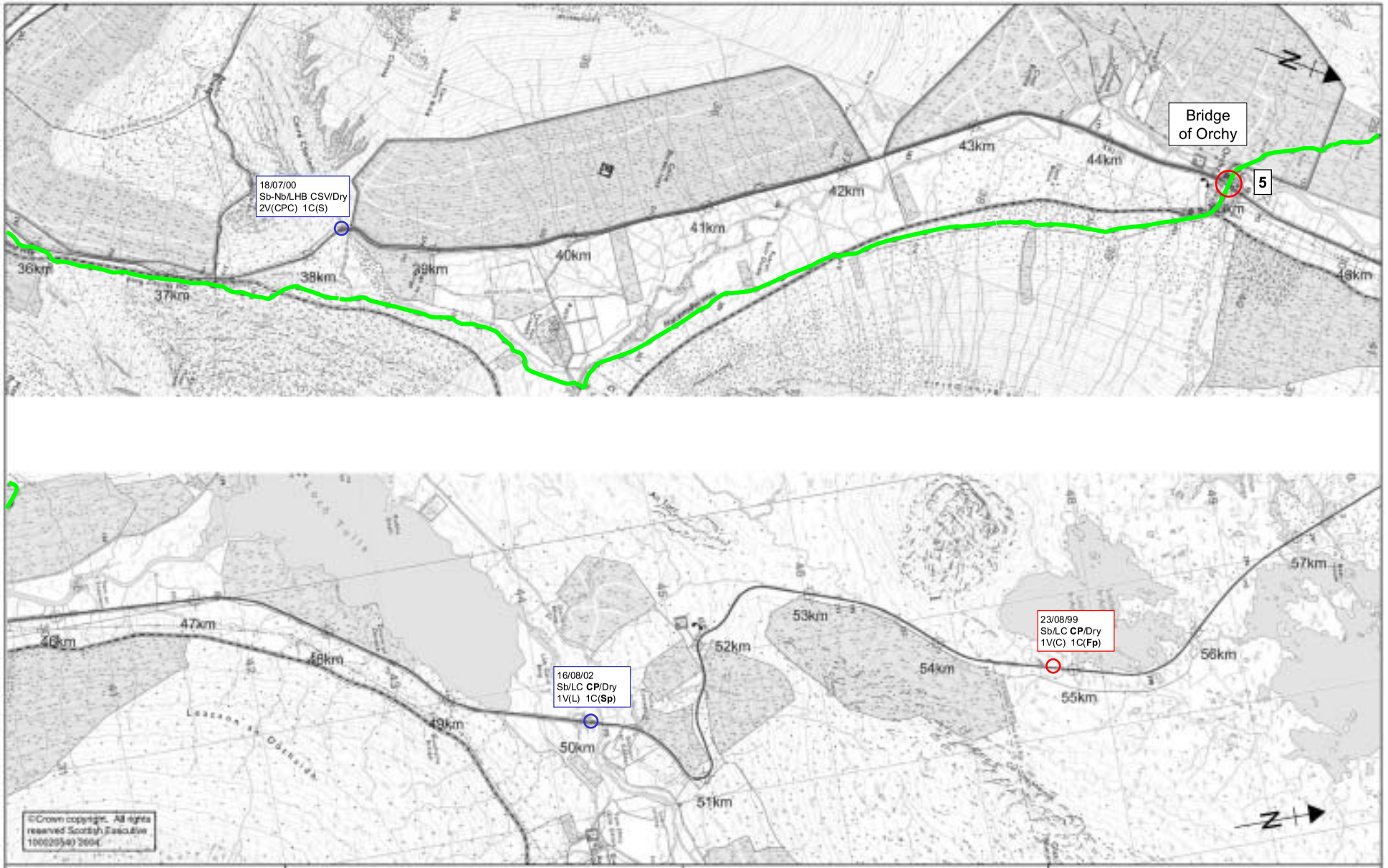

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Figure 9.1c
Pedestrians and Cyclist Details

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Figure 9.1d
Pedestrians and Cyclist Details

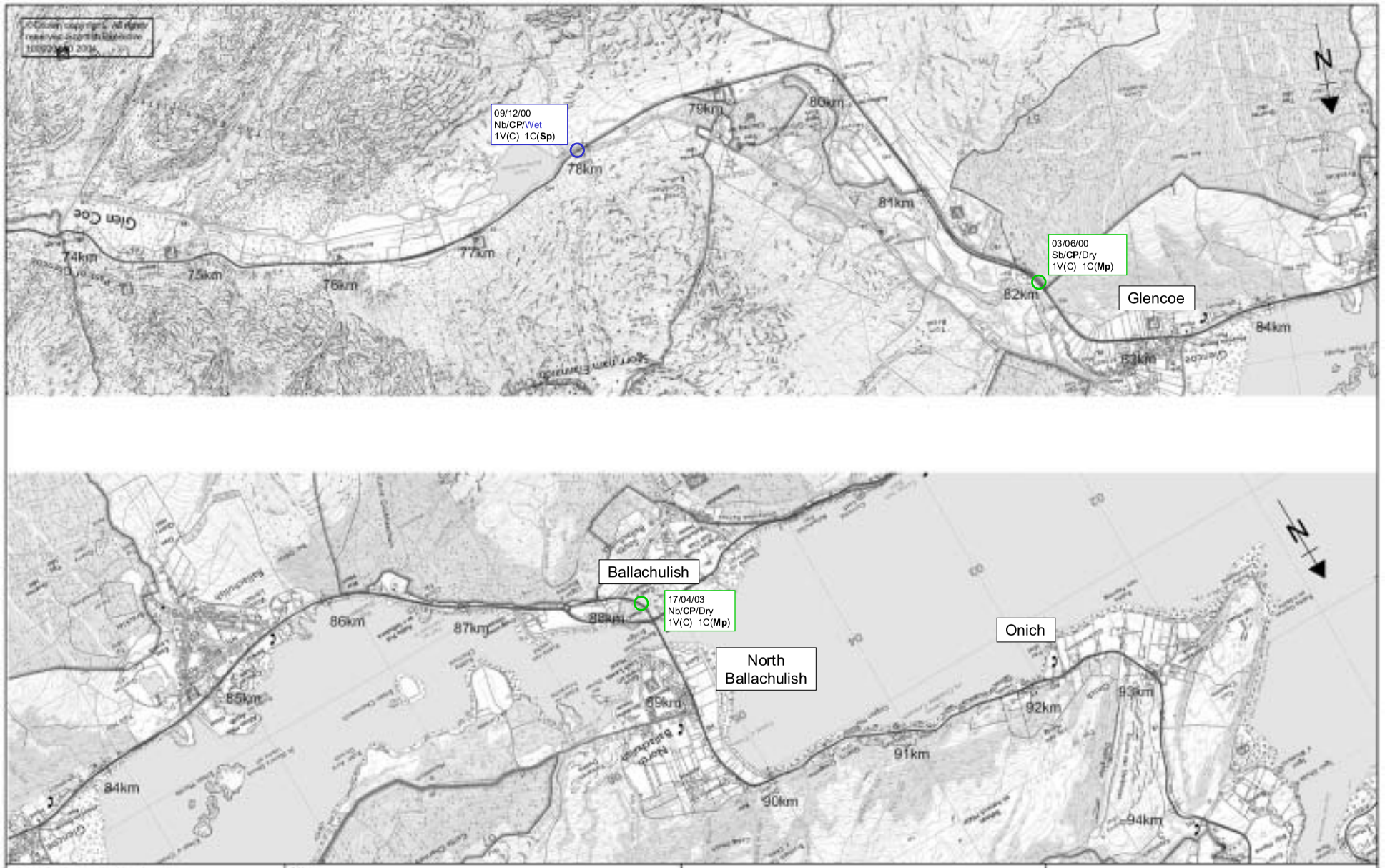

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Figure 9.1e
Pedestrians and Cyclist Details

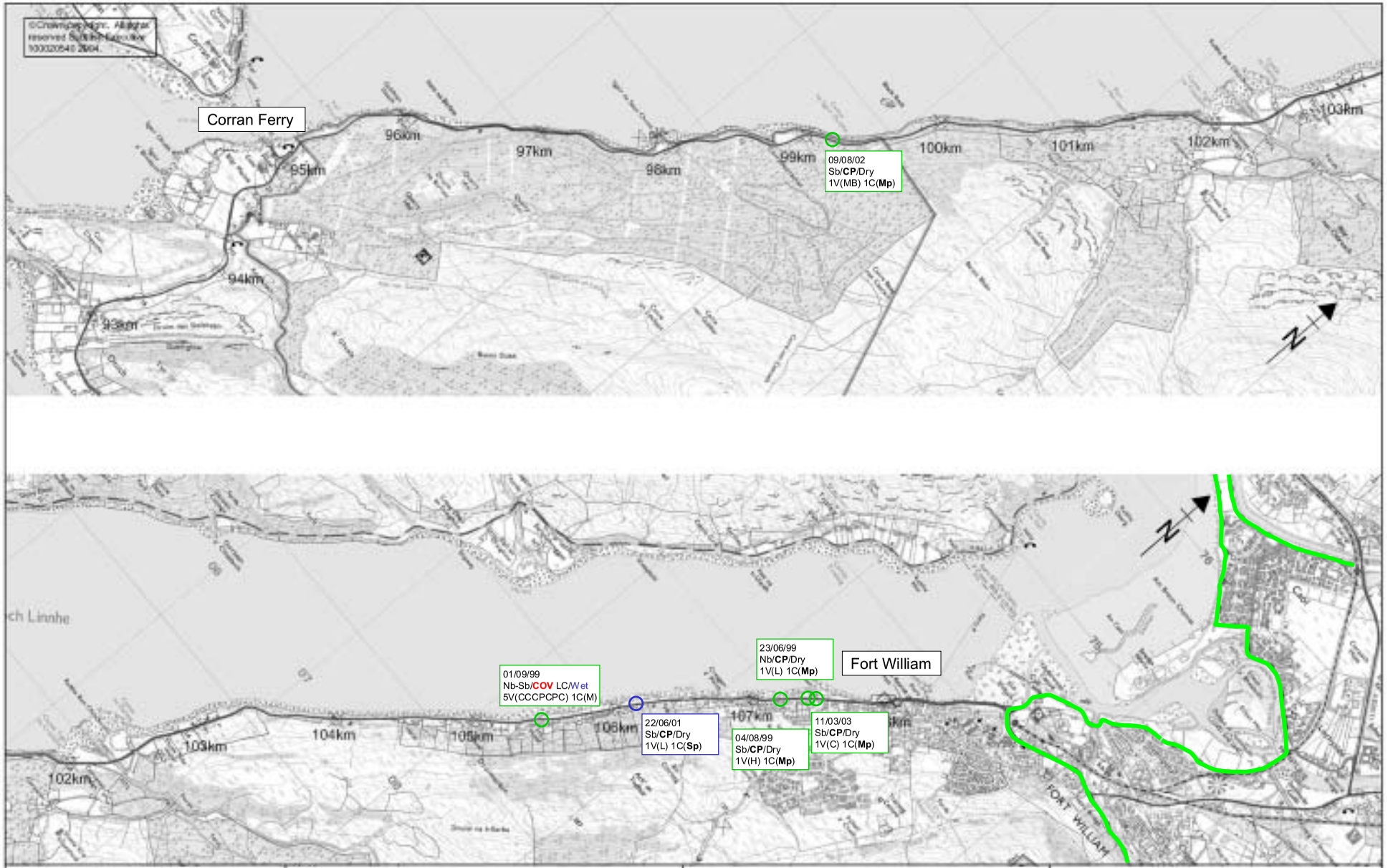

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Figure 9.1f
Pedestrians and Cyclist Details

10. STRATEGY FOR IMPROVEMENT

The purpose of the Firm Strategy Report is to define an overall strategy for improving conditions along the A82 through implementation of the various improvement options that have been identified through the development of the Route Action Plan.

The aims and objectives of the strategy will need to be discussed and agreed with the Scottish Executive prior to firming up on the strategy in order to satisfy their core requirements for the route in particular and the trunk road network in general. However, based on the information presented in this report, the strategy is likely to incorporate the following five key areas:

- Carriageway Improvements;
- Road Safety;
- Localised Carriageway Width Restrictions;
- Lay-bys and Rest Areas; and
- Pedestrians and Cyclists.

As expected, the combination of low traffic flows, challenging engineering and sensitive environment, especially on the Loch Lomond section, has resulted in a package of improvement options of which only some provide positive returns in terms of transport economic efficiency.

However, it should be noted that a separate study undertaken by Hitrans and issued in September 2005 has indicated that upgrading the A82 route to address the key operational constraints could generate significant wider economic benefits. The report concluded that under the full investment scenario, the central forecast for additional income in Scotland would equate to £313m (discounted).

It should also be recognised that improving the Tarbet to Inverarnan section of the A82 could result in commercial vehicles, which it has been suggested presently use alternative and longer routes to avoid the potential delays on the A82, reassigning back to the A82. It is also possible that the impact of accidents due, at least in part, to the narrow carriageway between Tarbet and Inverarnan, generates delays which have not been quantified as part of the economic assessment but nevertheless can represent a significant cost to road users. Based on this, it is possible that the total economic benefits associated with some of the improvement options would exceed the level of benefits derived from the application of the standard economic assessment models.

On the southern section of the route along Loch Lomond, consideration has been given to the standard of carriageway required taking into account current traffic volumes, the forecast in traffic growth, the potential effects of strategic traffic reassignment, and the sensitive environment. It is intended that the information contained in this report will provide a reasonable basis to inform the debate on the provision of either a 6.0m or 7.3m wide carriageway taking into account the capital cost, the road user benefits and the impact on the environment.

The overall strategy for improving conditions along the A82 is set out below and includes a programme of schemes over the short, medium and longer term. The strategy includes improvements to address road safety, carriageway width restrictions, the provision of lay-bys and rest areas, facilities for pedestrians and cyclists, and carriageway improvements.

Short Term Measures

The short term measures include localised improvement options such as accident remedial schemes which, for the purposes of the study, should be capable of implementation within a two year time frame.

The short term measures for consideration in the A82 Tarbet to Fort William Route Action Plan therefore include:

- A programme of some 14 road safety / accident remedial measures
- A programme of improvements for some 10 lay-bys

The total estimated construction cost for the above measures is £1.1m.

Medium Term Measures

The medium term measures include schemes such as junction improvements which, for the purposes of the study, should be capable of implementation within a two to five year time frame.

The medium term measures for consideration in the A82 Tarbet to Fort William Route Action Plan therefore include:

- A programme of improvements for some 6 rest / picnic areas
- A programme of improvements to address some 25 carriageway width restrictions including widening of narrow structures, especially where major schemes have not been developed
- A programme of improvements for pedestrians and cyclists, although these facilities could be incorporated into the carriageway improvements

The total estimated construction cost for the above measures is £4.0m.

Long Term Measures

The long term measures include schemes such as bypasses, climbing lanes, and carriageways improvements which, for the purposes of the study, should be capable of implementation within a five to ten year time frame.

The following major improvement options were identified as part of the Route Action Plan, however, it should be noted that some of the options are considered to have a significant impact on the environment:

Loch Lomond Improvement (6.0m wide carriageway)

The total indicative construction cost estimate that was used as the basis of the economic appraisal of the Loch Lomond carriageway widening improvements equates to £37.5m excluding OB, increasing to £54.0m with 44% OB, excluding VAT. Details of the individual scheme are as follows:

- Tarbet to Pulpit Rock — Const. Cost £26.1m (Exc. OB) to £37.5m (44% OB)
- Pulpit Rock — Const. Cost £4.5m (Exc. OB) to £6.5m (44% OB)
- Pulpit Rock to Inverarnan — Const. Cost £6.9m (Exc. OB) to £10.0m (44% OB)
- Tarbet to Inverarnan — Const. Cost £37.5m (Exc. OB) to £54.0m (44% OB)

Including an allowance for preparation and supervision, in accordance with the standard procedures defined in the Design Manual for Roads and Bridges, the corresponding total scheme costs for Tarbet to Inverarnan are £43.9m and £63.2m, excluding VAT.

Based on the summation of the combined NESA and QUADRO results, the approximate NPV of the improvement would be £6.01m, with a corresponding BCR of 1.11.

Although a more detailed assessment will be required to fully assess the costs and benefits of the 6.0m and 7.3m wide carriageway, the information presented in this report indicates that the provision of a 6.0m wide carriageway with 1.0m wide hard strips and 2.5m wide verges, with an overall width of 13.0m, provides a better economic return in terms of net present value and benefit to cost ratio. It is also likely to have less impact on the sensitive environment.

If the 6.0m wide carriageway option were taken forward, it is likely that localised carriageway widening would be required on some of the tighter horizontal radii to minimise the risk of collision between northbound and southbound heavy vehicles and coaches.

It should also be noted that should strategic traffic reassignment occur following the improvement of the Loch Lomond section, the ultimate traffic flow could exceed the 5000 AADT volume defined in DMRB above which the 6.0m wide carriageway would no longer be appropriate. If this is the case and the 6.0m wide carriageway option is taken forward, the impact on the environment of subsequently widening the road to 7.3m is likely to be significant.

Crianlarich Bypass

The indicative construction cost estimate that was used as the basis of the economic appraisal of the Crianlarich Bypass equates to £3.1m excluding OB, increasing to £4.4m with 44% OB, excluding VAT. Including an allowance for preparation and supervision, the corresponding total scheme costs are £3.6m and £5.1m, excluding VAT.

Based on the combined NESA and QUADRO results, the NPV of the scheme would be -£1.92m, with a corresponding BCR of 0.57.

Although the provision of a new roundabout, as included in the do-something model, would provide a reasonable junction between the A82 and A85, the road user costs associated with delays at the roundabout are significant. An initial examination of an alternative layout, based on the provision of a priority junction, with the A85 forming the minor arm, suggests that the benefits of the scheme would be more consistent with the scheme costs.

Loch Tulla Climbing Lane

The indicative construction cost estimate that was used as the basis of the economic appraisal of the Loch Tulla Northbound Climbing Lane equates to £10.0m excluding OB, increasing to £14.3m with 44% OB, excluding VAT. Including an allowance for preparation and supervision, the corresponding total scheme costs are £11.7m and £16.7m, excluding VAT.

Based on the combined NESA and QUADRO results, the NPV of the scheme would be -£0.01m, with a corresponding BCR of 1.00. Given the lower economic returns for this scheme and the significant impact on the environment, a more detailed assessment of the scheme is required.

Corran Ferry to Fort William (Part Only)

The indicative construction cost estimate that was used as the basis of the economic appraisal of the Corran Ferry to Fort William carriageway improvement equates to £8.5m excluding OB, increasing to £12.2m with 44% OB, excluding VAT. Including an allowance for preparation and supervision, the corresponding total scheme costs are £9.9m and £14.3m, excluding VAT.

Based on the combined NESA and QUADRO results, the NPV of the scheme would be £4.06m, with a corresponding BCR of 1.36.

Given that the improvement option was limited to the widening of the road to create a standard 7.3m wide carriageway over a 4km length, the economic returns are reasonable and suggest that further improvements to this section may be possible.

The long term measures therefore include the following schemes:

- Tarbet to Pulpit Rock
- Pulpit Rock
- Pulpit Rock to Inverarnan
- Crianlarich Bypass
- Loch Tulla Climbing Lane
- Corran Ferry to Fort William (part only)

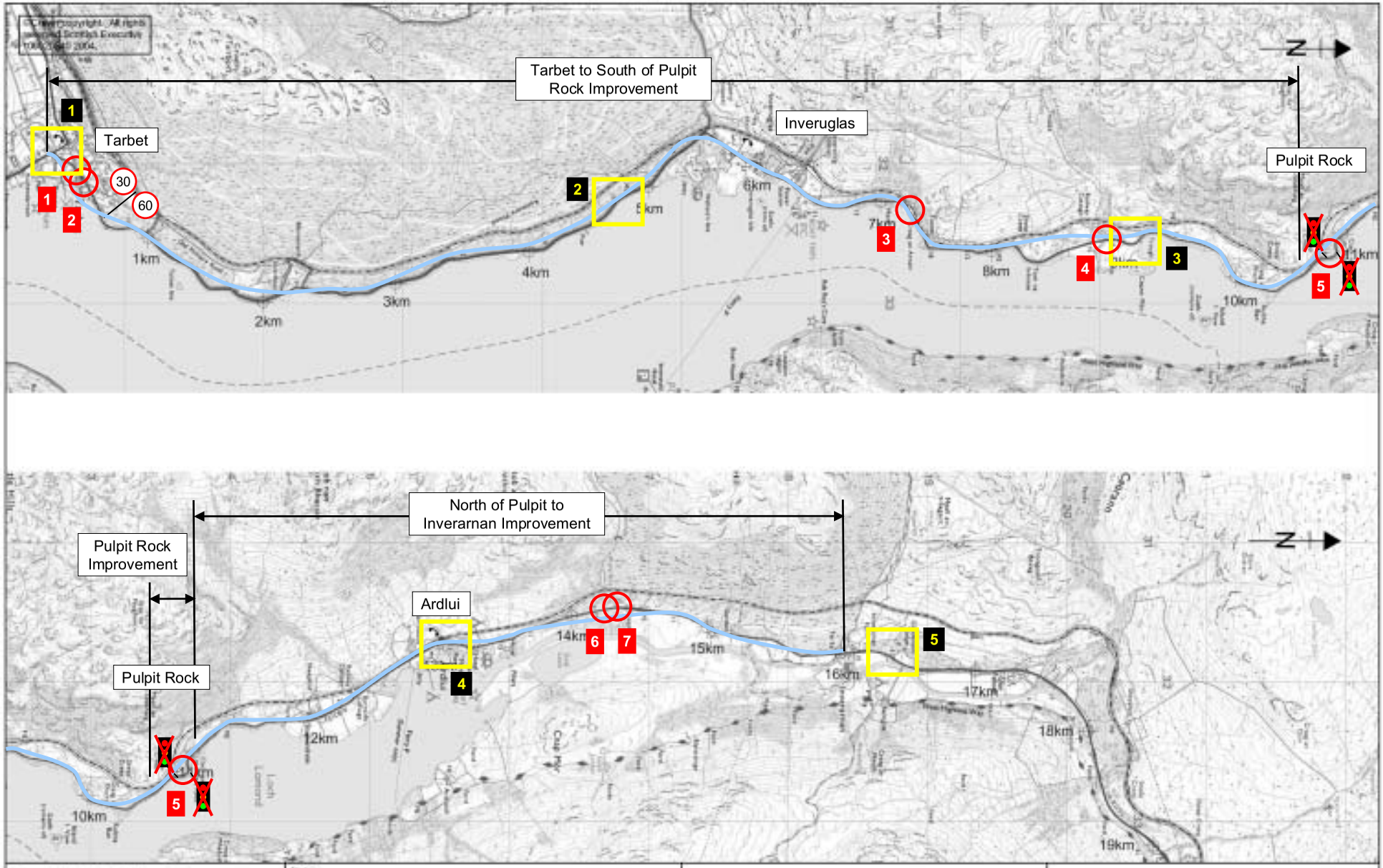
The total indicative construction cost estimates used as the basis of the economic appraisals of the 22.8km improvements equates to **£59.1m** excluding Optimism Bias (OB), increasing to **£84.9m** with 44% OB, excluding VAT.

In accordance with the standard procedures defined in the Design Manual for Roads and Bridges, the costs for the preparation and supervision of the above schemes based on 12% and 5% respectively equates to an additional £14.4m on the £84.9m total cost estimate, which results in a total scheme cost of **£99.3m** for the major schemes that form the basis of the Route Action Plan.

The overall NPV of the carriageway improvements is **£8.1m**, with a corresponding BCR of **1.09** based on the application of 44% optimism bias. As a sensitivity test, the NPV for the same package of improvements based on 25% optimism bias is **£19.9m**, with a corresponding BCR of **1.27**.

The locations of the Short, Medium and Long term improvement options are shown in Figures 10.1a to 10.1f.

As part of the detailed implementation strategy for the 5 to 10+ year period, schemes that maximise economic returns or address key operational problems along the route, such as road user delays and journey time reliability and therefore deliver significant benefits to the road users, should be brought forward more rapidly within the long term programme.



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Route Improvement Options

Accident Remedial Measures

Local Carriageway Widening

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Firm Strategy Report

Figure 10.1a
Route Strategy Improvement Options

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Route Improvement Options

Accident Remedial Measures

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Figure 10.1b
Route Strategy Improvement Options

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Route Improvement Options

Accident Remedial Measures

Local Carriageway Widening

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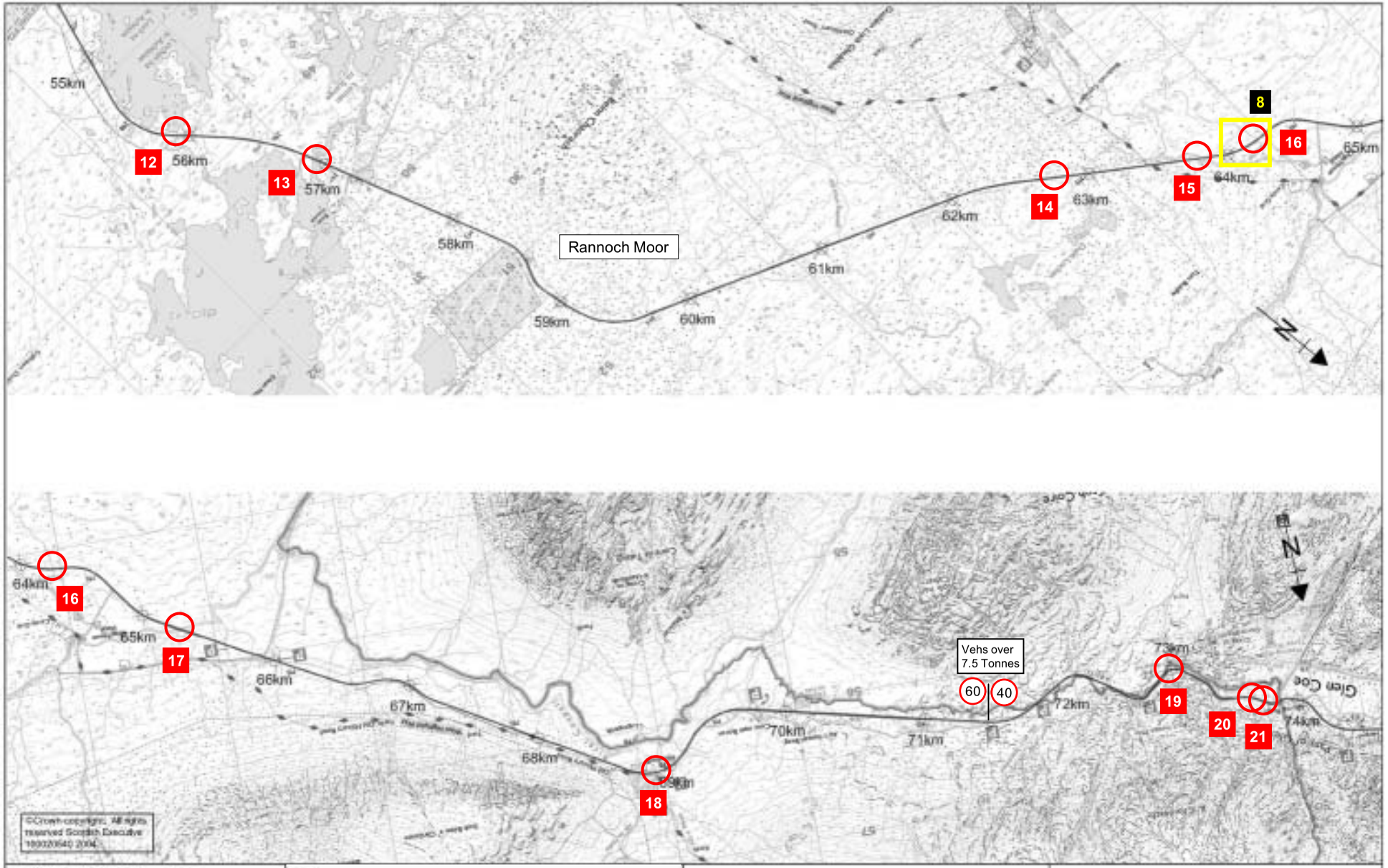
Figure 10.1c
Route Strategy Improvement Options



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Route Improvement Options

Accident Remedial Measures

Local Carriageway Widening

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Route Action Plan Study
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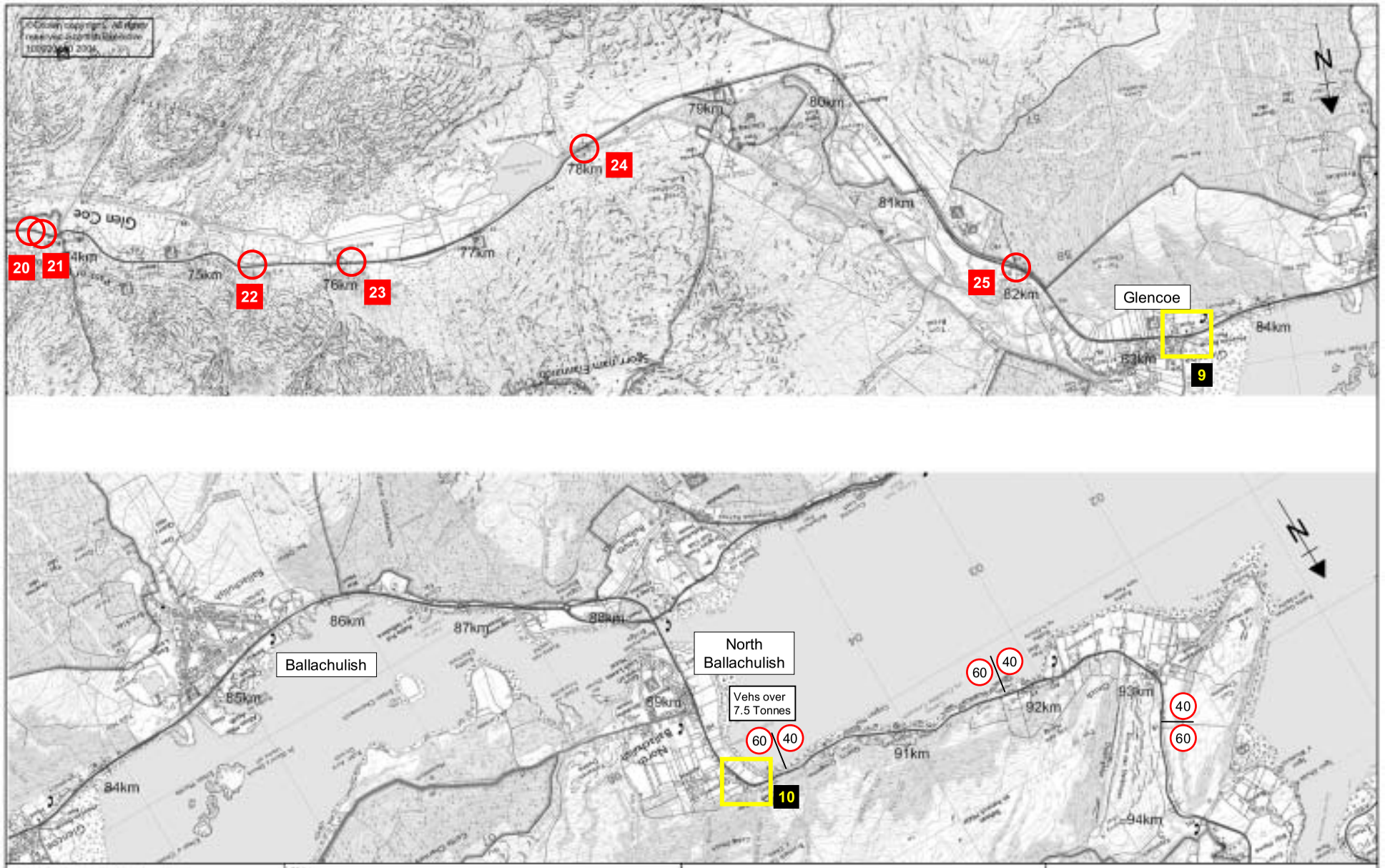
Figure 10.1d
Route Strategy Improvement Options



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Route Improvement Options

Accident Remedial Measures

Local Carriageway Widening

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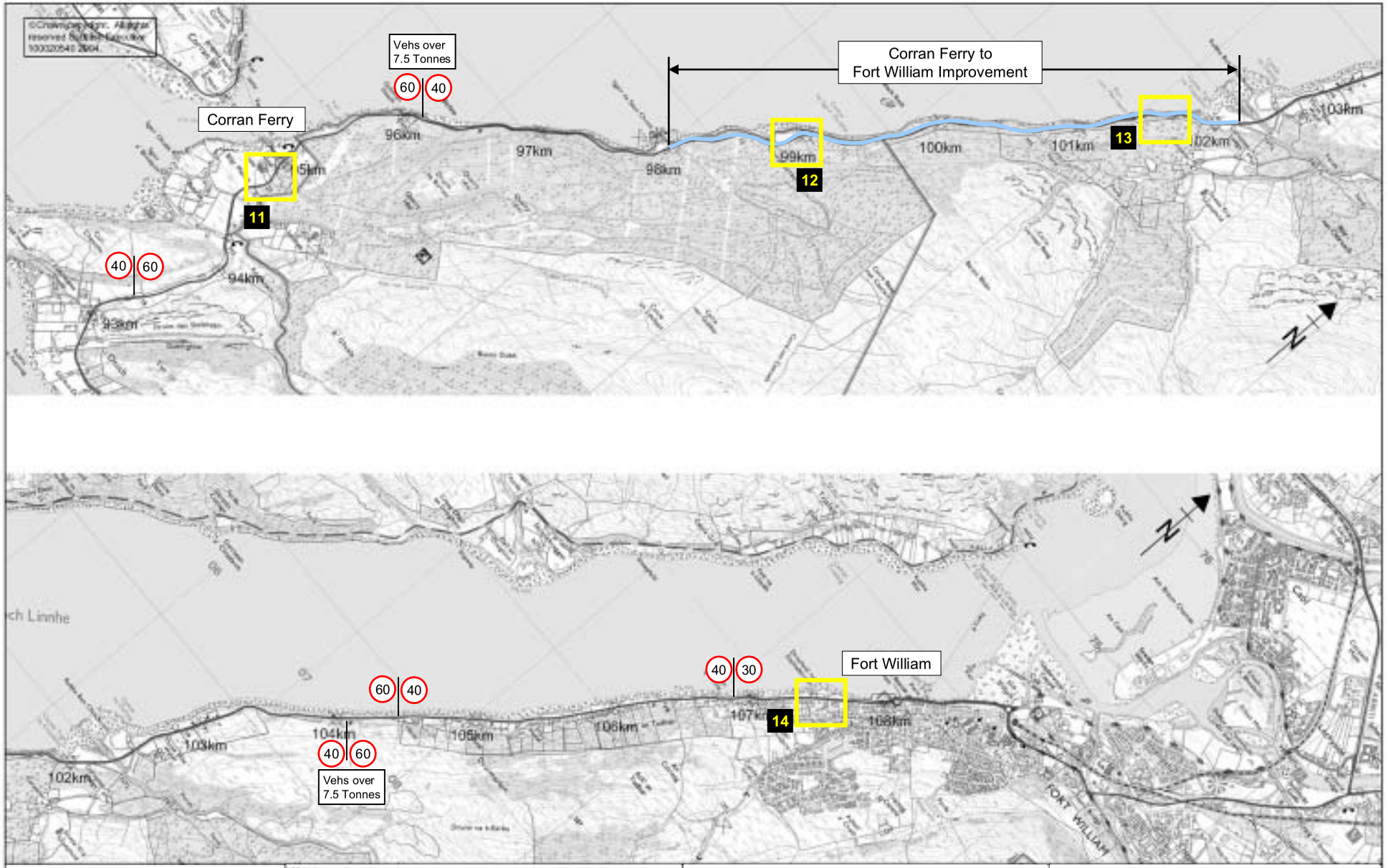
Figure 10.1e
Route Strategy Improvement Options



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Route Improvement Options

Accident Remedial Measures

Local Carriageway Widening

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Figure 10.1f
Route Strategy Improvement Options

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